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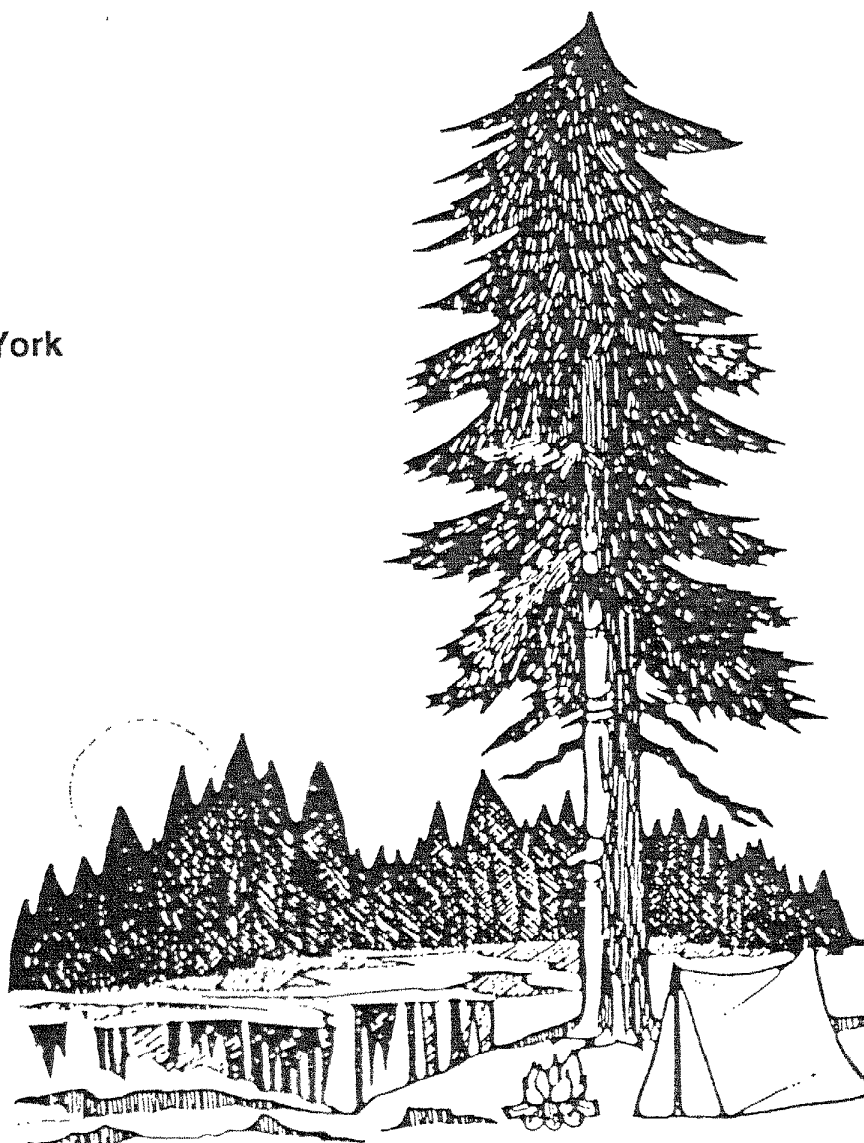
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April 7-9, 1991

Saratoga Springs, New York



NORTHEASTERN RECREATION RESEARCH MEETING POLICY STATEMENT

The Northeastern Recreation Research meeting seeks to foster quality information exchange between recreation and travel resource managers and researchers throughout the Northeast. The forum provides opportunities for managers from different agencies and states, and from different governmental levels, to discuss current issues and problems in the field. Students and all those interested in continuing education in recreation and travel resource management are particularly welcome.

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PROCEEDINGS of the 1991 NORTHEASTERN RECREATION RESEARCH SYMPOSIUM

April 7-9, 1991

**State Parks Management and Research Institute
Saratoga Springs, New York**

Compiled and Edited by:

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FISHERIES AND WILDLIFE

FISHERIES AND WILDLIFE MANAGEMENT

ANGLERS' BELIEFS ABOUT

TAG-AND-RELEASE PROGRAMS

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Scientific research and the popular literature have emphasized the biological value of tag-and-release fishing. Relatively few publications, however, have examined the anglers' beliefs about the importance of this activity. This paper summarizes sport fishermen's behavior and attitudes related to tag-and-release programs. The data were collected from three sport fishing forums, a shark tournament, and a mailed survey to offshore marlin and tuna anglers. Almost all participants believed that tag-and-release fishing is important for conservation and research. The primary reasons for not participating were lack of knowledge about existing programs and who to contact, not wanting to be bothered with tagging, and concern about how the data are used. The findings suggested that education and incentives may significantly increase participation in tag-and-release programs.

Fish tagging programs have existed for a number of years. Tags typically have a serial number and instructions for returning the tag to the tagging agency. Monetary rewards are sometimes offered to encourage participation (Dell 1974). At a minimum, individuals who tagged the fish are informed by the agency when one of their tags is returned. This feedback provides additional incentive for participating in the program.

The popularity of tag-and-release fishing has increased dramatically. This growth can be partially attributed to the decline in fish stocks resulting from increased angling pressure and decreased water quality. Size limits and bag regulations have also contributed to the number of anglers who return caught fish to the water. In addition, tag-and-release efforts fit well with an increasing conservation awareness. Anglers can still enjoy their activity, while helping to maintain healthy fish stocks.

Both the scientific and popular literature have stressed the biological value of tag-and-release. The existing research emphasizes two major areas. Some research has concentrated on the tag-and-release process itself; examining such things as the effectiveness of different types of tags, and the factors related to hooking stress. Other studies have used the data obtained from returned tags to estimate growth and mortality rates.

Relatively few publications have considered the social aspects of tag-and-release fishing. The goal of this paper is to summarize sport fishermen's behavior and attitudes related to tag-and-release fishing. More specifically, the objectives are to: 1) assess angler involvement in the programs, 2) evaluate the perceived effectiveness of tag-and-release practices, 3) determine perceptions of the importance of the activity as a

conservation measure, and 4) identify ways to encourage future participation.

Biological Effects of Tagging

The impacts of tag-and-release on fish growth and mortality rates are complex. Numerous interrelated variables such as hook type, water temperature, anatomical hooking site and fish size influence this relationship, and the responses of fish are divergent even within a single species.

Additional complications arise because the findings from some biological studies do not always coincide with popular beliefs. Many anglers fish with barbless hooks, for example, because they believe that captured fish are easier to release. Other anglers prefer barbed hooks because they believe that fish are not hooked as deeply, and are less likely to be injured. The available empirical evidence indicates that there is no difference in mortality rates of fish caught on barbless and barbed hooks (Hunsacker and others 1970, Falk and others 1974, Bjornn 1975), and that the effect of hook type on fish survival is often related to other variables. Research comparing single barbless, treble barbless and treble barbed hooks (Titus and Vanicek 1988), found differential mortality among hook types was apparent *only* during high water temperatures. In this instance, the highest losses (59%) occurred with fish caught with single barbless hooks. Other investigations suggest that fish mortality is higher when single hooks as opposed to treble hooks are used (Klein 1965, Warner 1976, 1978).

Independent of hook type, other studies have found a relationship between water temperature and hooking mortality. Titus and Vanicek (1988), for example, show that for trout caught with lures, mortality was less than 1.5 percent at water temperatures between 5.5 to 15.5 degrees Celsius, but rose to nearly 50 percent as the temperature approached 21 degrees. Similar relationships have been noted for black bass (Bennett and others 1989) and large mouth bass (Schramm and others 1985). For those fish who did survive the tag-and-release process, the higher the water temperature, the more delayed their recovery (Wydoski and others 1976).

The anatomical site of hooking also influences mortality rates. Warner and Johnson (1978) found higher mortality rates for Atlantic salmon which were hooked in the esophagus as opposed to the jaw or mouth. Fish who bled after hooking were also more likely to die than fish who did not bleed.

Research findings on the impacts of size and age of fish on hooking mortality are mixed. In one study, the mortality of legal sized salmon was not significantly different from that of sub-legal salmon, nor were there differences in mortality of different age groups (Warner and Johnson 1978). Wydoski and others (1976), on the other hand, found that hooking imposed greater stress on larger than on smaller hatchery rainbow trout.

Contradictory results were also found for the effects of tagging on growth rates. Studies of lake trout (DeRoche 1963), walleyes (Smith and others 1952), redbait (Kelly and Barker 1963), and haddock (Jensen 1963) suggest that tagging impedes growth. The longer the tagged fish lived, the more retarded was their growth. These studies suggest that tags may have a signal effect, in that they startle live prey on which the tagged fish are attempting to feed. Tags may also interfere with the swimming abilities of fish. Contrary results were obtained by Jensen (1967) in a comparison of the growth rates of tagged and untagged cod fish. The tags had little effect on the growth of cod. It was hypothesized that the larger, robust cod can compensate for the attached tag better than the smaller species.

The suitability of different kinds of tags has also been studied. Eames and Hino (1983), for example, examined tag loss rates for different types of tags on Chinook salmon and found the tag-loss rates were low (2%-5%) for each tag tested (Floy anchor tags, machine- and hand-implanted coded-wire tags, modified Carlin and Swedish trailer tags). In a comparison of the Atkins streamer and Monel metal jaw tags, streamer tags were evaluated as unsatisfactory for long-term population studies, but were satisfactory for short-term river studies. The former judgment stemmed from the streamers' poor retention rates and considerable injury to the fish (MacGrimmon and Robbins 1979). Jaw tags, on the other hand, were effective for long-term ecological studies, because they had a high retention rate and caused little injury to fish. Neither tag proved effective for obtaining reliable growth rate data on smallmouth bass.

Davis (1959) found that bass tagged with streamers were recaptured less selectively by gill nets than those with Petersen tags. The streamer tag was also more durable, more legible, and less subject to physical and chemical change than either type of spaghetti tag. Contrary to MacGrimmon and Robbins (1979), the streamer tag was selected as the most satisfactory of the four tags tested.

Overall, the biological research shows no uniform or consistent relationship between tagging and fish growth and mortality. The type of hook used can influence survival, but the death rates are greater and recovery is slower in warmer waters. Some studies suggest that tagging results in greater stress for larger than smaller fish, whereas other investigations show no difference. Conversely, the growth rate of larger fish is less effected by tags than smaller fish. Summarizing the suitability of tags is difficult because the studies compared different types of tags and there is no clear pattern of findings. The complexity of this issue, when coupled with the divergent biological findings, highlights the difficulties in educating anglers about the importance of tag-and-release.

Social Research

A successful tag-and-release program requires three elements: 1) anglers must believe the technique benefits fish populations, 2) anglers must be willing to tag fish, and 3) even if they are not involved in tagging programs, anglers must return the tags they find on their catch. Most previous social research has focused on the last criteria; the percentage of anglers who return tags and the reasons for not engaging in this behavior.

During routine creel surveys, for example, the U.S. Fish and Wildlife Service secretly implanted fish tags into fish that had already been caught (Matlock 1981, Green and others 1983). In both investigations, less than a third of the implanted tags were returned. The return rates for some species (e.g., flounder, sea trout and red drum) were significantly higher than for other species (e.g., sheepshead, black drum and Atlantic croaker). A follow-up survey with a sample of these anglers, asked individuals to specify why they had not reported their tags (Matlock 1981). Failure to report the tag was most often a result of failure to find the tag.

Dell (1974) looked at tag returns by type of tag (Carlin dangler, Petersen disk, and Floy anchor pendant). Rewards of \$1.00 for each disk and \$10.00 for each dangler tag returned were offered during the first year of the study. No reward was offered for tags from fish released in the following year. Returns were generally the same for the three types of tags, however, more tags were returned when a reward was offered.

The study reported here builds on the previous social research by examining the all three criteria for a successful program. Anglers' beliefs about tag-and-release fishing, their reported participation in tag-and-release programs, as well as the reasons for not engaging in this behavior are investigated.

Methodology

Data for this paper were collected from three different sources. On-site surveys were administered to all individuals participating in three sportfishing forums held in New Hampshire, New York and Virginia during 1989. The survey was also distributed at a Fishermen's Magazine Shark Tournament in New Jersey during that same year. Finally, the identical questionnaire was mailed to offshore marlin and tuna fishermen in Virginia. A total of 378 surveys were completed.

The four-page questionnaire assessed anglers' participation in and beliefs about tag-and-release programs. Specific items addressed:

- * years participating in tagging programs
- * number of fish tagged and tags returned
- * species of tagged fish caught
- * problems with tagging programs
- * benefits of being involved in tag and-release
- * reasons for not trying tag-and-release
- * ways to encourage tag-and-release

Results

About a third (38%) of the anglers participated in tag-and-release programs (Figure 1). Among the participants, 25 percent had been involved with a program for only 1 or two years, while nearly a third each fell in the 3 to 5 (31%) and 6 to 10 (28%) year participation categories. Sixteen percent had done tag-and-release for more than 10 years.

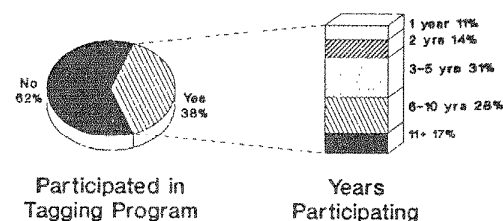


Figure 1. Years participating in fish tagging programs.

The National Marine Fisheries Service (NMFS) Cooperative Gamefish Tagging Program, and the NMFS Cooperative Shark Tagging Program were the two most popular programs (43% and 33%, respectively). Fifteen percent listed the American Littoral Society program, and 2 percent specified Tag-a-Tuna.

Anglers were asked how many fish they had tagged since joining a program (Figure 2). Only 3 percent reported tagging no fish. A third had tagged between 1 to 10 fish, about a quarter between 11 to 30, and about a fifth between 31 to 50 fish. Twenty-seven percent had tagged more than 50 fish.

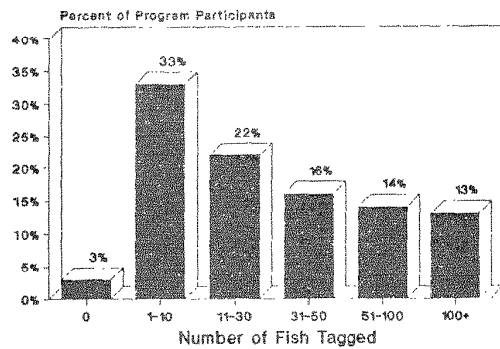


Figure 2. Number of fish tagged.

Each of the tagging programs notifies participants when a fish is returned with their tag. Sixty-one percent of the individuals who had tagged fish had none of their tags returned (Figure 3). A quarter (28%) had received back 1 to 5 of their tags, and 11 percent reported returns of more than 5 tags.

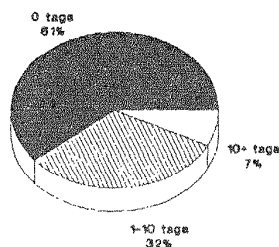


Figure 3. Number of tags returned.

Most participants (61%) had not encountered problems with their tagging program. For those who had difficulties, a quarter (26%) complained about inadequate instruction on tagging procedures (Table 1). Almost as many felt that either their tags had not worked well (23%) or the tagging apparatus had caused problems (21%). Nineteen percent had received slow feedback from the program or had problems getting new tags. Only one individual did not know who to contact for more tags.

Table 1. Types of problems encountered with tagging programs.

Types of problems encountered	Number of Respondents	Percent of Respondents
Inadequate instruction on tagging procedure	16	26%
Tags not working well	14	23
Problems with tagging apparatus (not tags)	13	21
Slow feedback, problems getting new tags, not enough tags	12	19
Not sure of survival of fish	6	10
Don't know who to contact for more tags	1	1
Total	62	100%

All respondents were asked about the types of tagged fish they had caught (Figure 4). Thirty-seven percent of those who responded had never caught a tagged fish. Tagged sharks and striped bass were caught most often (18% and 14%, respectively). Under a tenth reported catching tagged tuna, billfish and flounder.

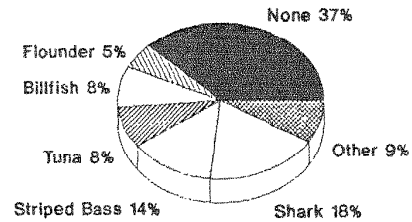


Figure 4. Species of tagged fish caught.

Nearly all (83%) of the individuals who had caught a tagged fish reported returning the tag. Of the 25 individuals who had trouble returning tags, 36 percent lacked knowledge or training in the tagging process (Table 2). Sixteen percent did not understand the importance of tagging and equally as many expressed concern over what happens with the data from tagged fish. A small number of respondents thought the programs were not effective (8%), wanted more incentives (8%), or simply lacked interest in participating (8%). Only one individual was unaware of existing programs.

Table 2. Problems which inhibit returning tags.

Problems which inhibit returning tags	Number of Respondents	Percent of Respondents
lack of knowledge or training in tagging process/techniques	9	36%
lack of understanding of the importance of tagging	4	16
concern over what happens with the data	4	16
believe programs not effective	2	8
lack of interest	2	8
need for incentive to return tags	2	8
lack of awareness of existing programs	1	4
too many different tag programs	1	4
Total	25	100%

General Beliefs About Tagging Programs

Non-participants were asked why they were not involved with tag-and-release programs. Although nearly half (49%) were aware of tagging programs, they did not know who to contact (Table 3). Eight percent each either did not know tagging programs existed or did not want to be bothered with tagging.

Seven percent were concerned about injuring fish, while a equal number questioned how tagging data are used. A small percentage of non-taggers were uncomfortable tagging fish, caught too few or too small fish to tag, or kept all their catch for personal consumption.

Table 3. Reasons for not trying tag-and-release.

Reasons for not trying tag-and-release	Number of Respondents	Percent of Respondents
Knew programs existed but did not know who to contact	131	49%
Did not know tagging programs existed for anglers	22	8
Fish for fun/don't want to be bothered with tagging	22	8
Concerned about injury to fish	19	7
Concerned about how tagging data are used	19	7
Not comfortable with tagging fish/too awkward	13	5
Not enough/too small fish caught	10	4
Keep catch for personal consumption	9	4
Do not fish for big gamefish	7	3
Too much trouble to keep up with tags & record data	7	3
Haven't sent for tags	4	2
Other	3	1
Total	266	100%

Almost everyone (99%) believed that there are benefits associated with becoming involved in tag-and-release. Education was seen as the most viable approach for encouraging more tag-and-release fishing (Table 4). These education efforts should include information on existing programs, the benefits of the programs, the status of fish stocks, and procedures for obtaining tags and handling fish. Twenty-two percent of the respondents believed incentives would increase participation. About a tenth felt more information on how the data are used would increase involvement, while increasing tag availability was mentioned by 6 percent.

Table 4. Ways to encourage tag-and-release fishing.

Ways to encourage tag-and-release	Number of Respondents	Percent of Respondents
Improve education and exposure for program	186	62%
Encourage tagging through incentive programs	65	22
Explain results of the tagging program	27	9
Make tags readily available	17	6
Other	6	2
Total	301	101%

Conclusions and Recommendations

Although the sample for this investigation was admittedly small, the findings suggest a number of issues for tagging agencies to consider. Most of the individuals who completed the survey were participants in either a sportfishing forum or a fishing tournament. One might expect to find a higher level of participation in tag-and-release programs among this sample when compared to the general angler population. While almost all recognized the benefits of tag-and-release, only a third of this group participated in a program. This suggests that additional promotional efforts are needed if participation is to increase.

Most participants reported no problems with their tagging programs. For those who had experienced problems, inadequate instruction on tagging procedures, ineffective tags, problems with the tagging apparatus and problems with getting new tags were cited most often. Each of these concerns are under the purview of the tagging agency, and therefore, can be improved upon.

Regardless of the anglers' involvement in a tagging program, most individuals reported returning tags from the fish they caught. Lack of knowledge about tagging procedures, the importance of tagging, and what happens with the tagging data were listed as reasons for not returning the tags. These findings again suggest that increased education efforts may stimulate greater participation.

Four of the five primary reasons for not participating in a tagging program were related to lack of knowledge about 1) existing programs, 2) who to contact, 3) proper procedures for tagging fish, and 4) how the data are used. Promotional information distributed where licenses are sold or through fishing supply outlets could increase anglers' knowledge and address these questions.

Finally, relatively inexpensive rewards (e.g., certificates, pins, hats) may increase participation in programs as well as the return of tags. Even simple acknowledgement of tag returns has been shown to provide an incentive for continued participation. Regardless of the reward structure, it appears that tagging agencies can increase the effectiveness of their programs by promoting their efforts through education and incentives.

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TRAPPERS IN NEW YORK AND VERMONT: COMPARISONS OF SOCIAL CHARACTERISTICS AND MOTIVATIONS

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Although trapping has a long history in North America, it is currently the focus of heated debate. Part of this debate concerns the reasons for trapping: is it a sport, a business, or a subsistence activity? Unfortunately, we know little about trappers, their attitudes, motivations, and personal characteristics. This paper presents the results of two trapper surveys—one in New York and one in Vermont. The results show great similarity across the trappers of both states. Muskrat and mink were the most common target species and most trappers in both states utilized foothold traps. The majority had an educational level of high school or less, and a median family income of between \$20,000 and \$30,000. These results may reflect more recreational than profit-oriented trappers, however, as many of the latter may have left trapping after several years of declining pelt prices.

Introduction

Furbearer trapping has a long tradition in North America. Long before European exploration, Native Americans engaged in trapping activities using primitive devices such as deadfalls and babiche snares. Fur trade and furbearer trapping provided much impetus for early exploration and settlement by Europeans. Over time, steel traps and wire snares were introduced and cash outlets for furbearer pelts became available. As the Nation developed trapping of furbearers was the primary source of income for some individuals, but many others supplemented income by capturing and selling furbearer pelts. In more recent times, recreation trapping has become more prevalent.

In recent years, Northeast trapping has been affected by a number of factors. Anti-trappers have attempted, by legislation, to outlaw or modify severely trapping equipment and practices. Trapping opportunities have been diminished by both loss of habitat and rights to access as a result of commercial and residential development, shifts in land

ownership, and land use changes. Pelt prices for most furbearers also have declined substantially during the past decade. As a result of these and possibly other factors, the number of trappers in New York and Vermont have declined considerably since the early 1980's. In Vermont, the number of licensed trappers dropped from a high of 3,090 in 1980 to 879 in 1989. For New York (a state with a substantially larger population), the number of licensed trappers fell from over 32,000 in the 1981-82 season to 12,338 in the 1989-90 season.¹

In order to gain a better understanding of trappers--their dependency on furbearers as a source of income, the motivations underlying participation, and their views toward various aspects of natural resource management--surveys were conducted of trappers in New York and Vermont by their respective state agencies. While the two studies were conducted independently of each other, they provide information on some of the human dimensions of furbearer trapping for two populations: one state which is essentially rural in character (Vermont) and one in which major urban centers play an important role in the socio-political climate (New York). In this paper, the similarities in and differences between these trappers are examined.

Methods

Information on trappers in New York and Vermont was collected through two separate mail surveys conducted during separate years. During summer 1989, the Vermont Department of Fish and Wildlife, in cooperation with the U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station at Burlington, conducted a survey of individuals who procured a Vermont trapping license for the 1988 calendar year (Glass et al., in press). A questionnaire solicited information on trappers' characteristics, motivations, satisfactions, level of effort during the 1988 season, views toward the changing trapping environment, and proposed changes in regulations. The questionnaires were sent to 293 randomly selected individuals who trapped during 1988, with 151 returning completed questionnaires--a return rate of 51.5 percent.

The New York survey (Siemer et al. 1991) was conducted through a cooperative agreement between the New York State Department of Environmental Conservation (DEC), the Human Dimensions Research Unit at Cornell University, and the Northeastern Forest Experiment Station. In February 1990, a subsample of 1,000 trapper-license holders was selected randomly from a sample also taken at random of 1989-90 trapping license holders used by DEC to conduct their annual telephone survey of furbearer harvests. An initial mailing and up to three follow-up reminders to nonrespondents were mailed during the spring of 1990, producing a response rate of 73.6 percent (n=718) excluding nondeliverables and nonusables.

The questionnaires used in the two states were similar but not identical. The analytical techniques employed also differed for several key areas of inquiry. For example, scales of trapper motivations were clustered using different techniques. In Vermont, the SPSS-X hierarchical-cluster analysis technique was applied to a list of motivation statements weighted by the respondents, while in New York, similar data were subjected to principal components factor analysis with varimax rotation. Different scales also were used to weight the responses from each state, but general comparisons of the results can be made.

¹/ Trapping licenses are valid for the calendar year in Vermont, but from October 1 to the following September 30 in New York.

The New York questionnaire originally contained 26 motivation statements; this number was reduced to 23 in the final factor analysis in order to increase overall scale reliability (Siemer et al. 1991). The Vermont study contained 41 motivational statements. Some of the motivational statements in the two questionnaires were identical but, once again, involved different time periods and different populations.

The responses from the two states were subjected to student t-tests and Bonferroni's Correction, where appropriate, to determine if differences among sample respondents statistically were significant.

Results

Generally, trappers in both states sought the same species of furbearers with similar intensity (Table 1). A higher proportion of New York respondents trapped beaver and raccoon, while more Vermont trappers pursued fishers, but no statistically valid inference could be made regarding differences in the total trapper populations within the respective states. Even though New York has longer trapping seasons than Vermont for most species of upland furbearers, there was little difference in the average number of days that respondents had traps set for given species. Meaningful comparisons of average furbearer harvests are difficult to make because of the different years involved.

Table 1. Trapper participation by species, number of days trapping for given species, and average harvest of furbearers by species, New York (1989-90 season) and Vermont (1988 season).

Furbearer species	Percent of trappers who attempted to trap species		Number of days traps set for species over season				Average harvest of furbearers for those pursuing given species New York ^a Vermont	
			New York		Vermont			
	New York	Vermont	Mean	Standard deviation	Mean	Standard deviation		
Beaver	44	27	23	20.5	17	12.2	4	9
Bobcat	7	9	15	4.8	10	2.7	b	1
Coyote	26	28	22	13.9	23	15.8	b	4
Fisher	11	29	16	6.1	9	2.8	b	2
Gray fox	28	18	23	16.9	20	10.7	3	5
Mink	48	45	24	56.5	18	11.8	4	5
Muskrat	59	56	24	23.3	22	20.4	38	70
Opossum	5	c	14	4.7	c	c	6	c
Otter	10	12	27	11.5	23	22.0	b	1
Raccoon	53	40	23	20.1	20	12.3	12	13
Red fox	49	42	22	17.8	21	14.3	5	6
Skunk	3	4	22	5.9	24	20.4	d	13
Other	0	2	7	0.3	31	23.9	d	4

^a Information provided by New York State Department of Environmental Conservation.

^b Average harvest less than one furbearer per trapper.

^c Information not available. While opossum exist in Vermont, they are not considered an important furbearer and were not included in the survey by the Vermont Department of Fish and Wildlife.

^d Information not reported.

The number of traps owned by respondents did not vary substantially between the states (Table 2). In fact, the median number of traps owned by category were almost identical, although the means differed to some extent (mean number of foothold traps was 89 for New York trappers and 78 for Vermont trappers). With respect to body gripping traps, the average for New York trappers was 64, compared to 48 for Vermont trappers. Neither of these differences was statistically significant at the 5 percent level.

While an overwhelming majority of trappers in both states sold furbearer pelts to local buyers, they also were likely to utilize other outlets. The two samples revealed some differences in secondary product utilization. Other parts of furbearers besides the pelts were sold by 21 percent of New York trappers, but only 14 percent of Vermont trappers. New York trappers (24 percent) also produced more handicrafts from furbearers than their Vermont counterparts (13 percent). Slightly less than 30 percent of the trappers in each state utilized furbearer meat for personal consumption.

Table 2. Trap ownership by New York and Vermont trappers.

Type of Trap	Number of traps owned			
	New York trappers		Vermont trappers	
	Mean	Median	Mean	Median
Foothold	88.5	56.0	77.6	54.0
Body gripping	63.8	36.0	48.0	35.0
Padded foothold	1.2	0.0	0.4	0.0
Other	1.9	0.0	1.9	0.0
All	155.4	92.0	127.9	89.0

A minority of respondents in each state indicated that monetary income from trapping exceeded expenditures. Approximately 29 percent of Vermont trappers reported positive net returns, compared to 20 percent in New York. Another 27 percent of Vermont trappers and 21 percent of New York trappers broke

even. The remainder of the trappers (48 percent in New York and 44 percent in Vermont) had expenses that exceeded income. Eleven percent of the New York respondents indicated that they couldn't recall their expenses. It should be reemphasized that these surveys were conducted in different years, so the differences might be attributed, in part, to changing pelt prices.

In both states, trapping occurred principally on private lands, but about 40 percent of the respondents in each case also used public lands.

For the most part, the trappers of the two states had similar socio-economic and demographic characteristics (Table 3). Based on the sample alone, there is some evidence that the age structure of New York trappers is somewhat younger than that for Vermont; both mean and median ages for Vermont trappers exceed those of New York. Further, one-third of New York respondents were under 30 years of age, compared to 12 percent of Vermont trappers. A higher proportion of Vermont trappers also were over 60 years of age. While these sample characteristics are of interest, they are not statistically significant at the .05 level.

Table 3. Characteristics of New York and Vermont trappers.

Characteristic	New York	Vermont
Age		
Mean	39.8	48.0
Standard deviation	17.2	14.3
Median	37.0	50.0
Percent over 60 years	14.6	20.0
Percent between 30 and 60 years	52.8	68.0
Percent under 30 years	32.6	12.0
Education: highest level of attainment		
Below high school	26.3	19.9
Percent completing high school	42.4	46.4
Percent attending college	21.9	20.5
Percent completing college	5.5	9.9
Attended graduate school	3.9	3.3
Household income		
Median	\$20,000 - \$29,999	\$20,000 - \$30,000
Percent under \$10,000	14.4	13.3
Percent over \$50,000	13.6	9.1

Measures of education attainment and income were quite similar for the trappers of both states. Over three-quarters of the respondents from each state indicated that they had completed at least high school, and it should be noted that many younger trappers were still attending school, so their final level of educational attainment had not yet been reached. Median household income levels were in the \$20,000 to \$30,000 range in both cases. For both states, household incomes less than \$10,000 were reported by approximately one-seventh of the respondents. On the other hand, over 10 percent of the respondents from both states were in excess of \$50,000.

In terms of trapping background and experience, trappers from both states were similar (Table 4). Vermont respondents indicated somewhat greater experience, but this might well be attributed to differences in wording of the questions. Experience in New York was related to purchase of a trapping license, whereas Vermont trappers were asked only to indicate the number of years they had trapped. Since younger trappers are not required to purchase licenses, this, alone, might explain the

slight discrepancy between the two states. Age when an individual began trapping was also based on purchase of a license in New York, but not in Vermont. For both states, both the mean and median ages that individuals began trapping was in the teens.

Table 4. Background and experience of New York and Vermont trappers.

Characteristic	New York	Vermont
Years of trapping experience		
Mean	15.9 ^a	21.4 ^b
Median	12.0 ^a	16.5 ^b
Age began trapping		
Mean	19.0 ^c	16.9 ^d
Median	16.0 ^c	13.0 ^d

^a Years in which a New York trapping license was procured.

^b Total number of years trapped

^c Age at purchase of first New York trapping license.

^d Age first began trapping regardless of trapping license purchase.

Even with the differences relating to data collection and analysis with respect to motivational statements, some general comparisons for the trappers of the two states can be made. Trappers in both states tended to have a wide range of motivations, but there also was considerable commonality with respect to motivations among individuals and between states. Motivations such as being outside and interacting with wildlife, were acknowledged widely by the respondents from both states. Other reasons for trapping cited by a high proportion of respondents related to escape from daily routine, achievement, exercise and physical health, stimulation, and solitude.

For the New York study, the factor analysis grouped trapping motivations into six dimensions or factors (Table 5). Based on the loadings retained, the factors are identified as: (1) escape and relaxation; (2) appreciation of wildlife, nature, and the outdoors; (3) personal accomplishment or achievement; (4) utilitarian incentives (obtaining meat, nuisance or damage control); (5) personal health and fitness; and (6) affiliation with other people, especially family members. Sample group means indicated that the strongest dimensions of motivation related to nature appreciation and personal achievement, while motivations related to socialization and affiliation were less important.

The cluster analysis of the Vermont data reduced the number of viable motivations from 42 to 27 and identified nine clusters (Table 6). The mean weights indicate the clusters most favored by the respondents, with the maximum possible score being 5.00. As with factor analysis, each cluster is described on the basis of the elements that it contains. For Vermont trappers, the highest weighted clusters were challenge, interaction with nature, and personal achievement. Other clusters with high ratings were technical achievement, escape, health and fitness, and socialization. Disseminating trapping skills had a rating somewhat above the median but below the clusters previously described. The cluster relating to the importance of income from trapping was at mid-scale, indicating that it tended toward a neutral overall rating.

Table 5. Factor descriptions and loadings for 23-item motivational scale for New York trappers, 1989-90 season.

Factor	Description	Motivational Scale Element	Factor Loading
Factor 1	Nature appreciation	To experience/enjoy nature	.8197
		To observe wildlife	.7358
		To learn about wildlife	.6829
		To spend time outdoors	.5406
		To feel like a part of nature	.5080
Factor 2	Escape	To get away from everyday problems	.7030
		To get some time to think	.6883
		To relax and relieve stress	.6198
		To get a chance to spend time alone	.5853
		To get a change from my routine	.3895
Factor 3	Personal achievement	To get a sense of accomplishment	.6030
		To test my skills and abilities	.5892
		To do something challenging	.5335
		To get a sense of self-sufficiency	.5072
		To do something exciting	.4275
Factor 4	Affiliation/socialization	To maintain family tradition	.6239
		To be with family members	.5496
		To teach or share my skills	.4916
Factor 5	Economics	To control nuisance animals	.8120
		To control predators	.7647
		To obtain meat for myself, family	.5435
Factor 6	Health, fitness	To get exercise	.7982
		To stay in shape	.5264

Percent variance explained by Factors: F1 (28.8) + F2 (6.1) + F3 (5.9) + F4 (4.3) + F5 (3.4) + F6 (3.0) = 51.4

Source: Siemer, W.F.; Batcheller, G.R.; Brown, T.L.; Glass, R.J. 1991. Characteristics, motivations, and involvement of trappers in New York. Human Dimensions Research Unit Series Publication 91-1. Dept. of Natural Resources, College of Agriculture and Life Science, Cornell University, Ithaca, N.Y. 37 p.

Table 6. Cluster analysis and mean weights by cluster for Vermont trappers' motives, 1988 season.

Cluster	Description	Motivational Scale Element	Mean Weight
Challenge		I enjoy being outdoors I find trapping exciting	4.71
Interaction with nature		Trapping is a good change in my daily routine I like being outside in trapping season Trapping helps me get away from some of life's routine demands Trapping is a real change of pace Trapping makes me feel at one with nature I enjoy learning about all kinds of wildlife I enjoy observing wildlife while on the trapline My relationship with wild animals is personally important to me	4.48
Personal achievement		The anticipation is a big part of trapping Trapping gives me a sense of personal achievement	4.40
Technical achievement		I enjoy perfecting my trapping techniques I enjoy the art of camouflaging sets	4.33
Escape		I enjoy the solitude on my trapline Trapping helps me relax and relieve tension Trapping gives me time to think	4.23
Health/fitness		Trapping helps me keep in shape Trapping keeps me physically healthy I like the challenge of trapping	4.11
Socialization		I enjoy being part of the trapping community I enjoy the company of other trappers away from the trapline	4.11
Disseminate skills		I like to teach others about trapping I like to help others develop trapping skills I enjoy sharing my trapping skills with others	3.77
Income		Trapping helps pay the bills Trapping provides extra spending money	2.94

Source: Glass, Ronald J.; More, Thomas A.; and DiStefano, Jim. (in press). Vermont trappers: characteristics, motivation, and views. U.S. Department of Agriculture, Northeastern Forest Experiment Station.

Summary and Discussion

The numbers of licensed trappers in both New York and Vermont have steadily declined since the early 1980's. A general decline in furbearer pelt prices certainly is a major factor in this decline, but other factors are also relevant. Trapping opportunities are becoming more scarce, and anti-trapping sentiment appears to be increasing. Since profit-oriented trappers are more likely to be discouraged by low pelt prices than recreational trappers, the results of these two surveys may be more reflective of those trapping for non-monetary motivations. Profit-seeking trappers are more likely to sit out years having low pelt prices and to seek alternative sources of income in the interim. Nonetheless, almost one-third of the respondents indicated that securing additional income was an important motivation for trapping. In the current market situation, recreational motivations predominate, but a significant subpopulation of income-motivated trappers remains active.

Trappers in each of these two states were quite similar in the species trapped and the average number of days in which traps were set, even though New York had longer trapping seasons for most upland species. While sample responses differed in some cases, such as a higher proportion of trappers in New York seeking beaver and raccoon, these differences were not different significantly at the 5 percent level. Only minor differences were reported in harvest levels for most species, muskrats being the lone exception. Again, the difference in muskrat harvest was not statistically significant, and did involve different years, so species availability and pelt prices may have been an influence.

Trap ownership by type was also similar for both states. In both cases, few respondents owned padded foothold traps, so regulations outlawing conventional foothold traps would require most trappers to invest in new equipment or rely on greater use of body gripping traps. The latter are viewed as more humane, but kill non-target species as well as target species.

In terms of demographic characteristics, there were, again, considerable similarities between the trappers of the two states. Educational attainment among trappers from New York and Vermont approximated one another. Household incomes were within the same range. An important consideration is that nearly 14 percent of the respondents from each state had household incomes of \$10,000 or less. Participation in trapping may provide a source of income, as well as psychological and sociocultural payoffs for which low-income, rural households have limited alternatives.

With respect to the age structure of trappers, there were apparent differences between New York and Vermont respondents. While statistically valid differences were not found, both the mean and median age of Vermont trappers exceeded those for New York trappers. Twelve percent of the Vermont trappers were under 30 years of age compared to almost one-third of New York trappers.

In both states, the strongest trapping motivations were "nature appreciation" and "personal achievement." Vermont trappers also had a strong measure for "challenge," but the variables in this cluster were included in the personal achievement factor for New York trappers. In both states, income or economic factors were at the bottom of the scale.

While there are considerable differences in the general perception of Vermont and New York with respect to pressures on resource use related to population density and urbanization, the characteristics and motivations of active furbearer trappers were quite similar. Obviously, information on the large number of trappers who have become inactive would improve our understanding of trapper behaviors, motivations, and anticipated payoffs. Certainly, the potential for dropouts to reenter the trapping community as various factors change over time is an important consideration in furbearer management. Further, trapping must be considered within the broader context of the diverse public demands for common property resources including furbearers.

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NEW HAMPSHIRE RECREATIONAL OYSTER HARVESTERS: PROFILE, PERCEPTIONS, AND ATTITUDES

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A survey of holders of a 1989 New Hampshire oyster-harvesting license revealed that recreational oyster harvesting is pursued mostly by older men. The 1988 closing of some parts of Great Bay to oyster harvesting resulted in license holders' taking one fewer trip and taking about six minutes longer to harvest one bushel of oysters in 1989. The average annual harvest also decreased almost one bushel. Respondents generally believed that Great Bay oysters were safe to eat. The majority of respondents were not interested in oyster depuration but were willing to contribute toward a fund dedicated to oyster-bed management. Logit analysis revealed that the probability of willingness to contribute to an oyster-bed management fund decreases when the respondent's annual income is smaller than \$20,000, and when the respondent's oyster-harvesting experience is fifteen years or fewer.

Introduction

Oyster harvesting in New Hampshire's Great Bay and its adjoining waters has a long tradition. A report entitled *The Fisheries and Fishery Industries of the United States*, published in 1887, says that Native Americans in pre-colonial times took oysters from the Bay [U.S. Commission of Fish and Fisheries]. The same publication reports that a commercial oyster industry that started in the area in 1874 declined in 1879 because of over-raking of the oyster beds.

Today only recreational oyster harvesting is allowed in the Bay. Many people in New Hampshire, particularly those living in the southeastern part of the State, pursue this pastime. All areas of the Bay were once open to oyster harvesting, but in 1988 the New Hampshire Fish and Game Department, the State agency that has jurisdiction over this activity, announced that because of pollution, oysters may not be harvested from certain areas.

The closing of those areas raises some important issues: first, how safe for consumption are the oysters taken from the remaining open beds? If the surrounding waters are polluted, wouldn't the open area become polluted eventually? Second, because the restrictions concentrate oyster harvesting in a smaller area than before, the threat of over-harvesting in the

open beds exists. How real or immediate is this problem? If license holders feel that the Great Bay oysters are unsafe to eat, or if they find that it is getting more difficult to harvest, they may cease the pursuit of this recreational activity. Oyster harvesting is generally, a pleasant and harmless way of enjoying nature's bounty. Compared to other outdoor activities, oyster harvesting poses minimal threat to the environment. Oyster harvesters, in their purchase of boats, equipment, and supplies also contribute to the economic well-being of businesses and towns around the Bay. For these reasons the possible demise of recreational oyster harvesting is a source of concern.

There are strategies that could solve the oyster-safeness and diminishing harvests problems. In particular, depuration has been used to rid oysters of contaminants that make them unsafe for human consumption. The process involves placing just-harvested oysters in tanks through which clean water runs. The oysters have to be kept in the tank for about twenty-four hours which allows them to filter out the contaminants. The problem of over-harvesting in the open area can be addressed by managing the oyster beds to maintain or increase oyster population numbers. Management could include activities like raking of the beds and planting cultch (i.e., materials like shells, etc. to which oyster larvae may attach) [Maryland Department of Fisheries].

There is little available information about oysters and oyster harvesting in Great Bay. The N.H. Fish and Game Department keeps a record of people who purchase licenses, and estimates the total oyster population periodically. Beyond these, information about the harvesters, the volume of harvest, and other oyster-related factors and activities do not exist.

The Survey

In April 1990, a survey of 1989 New Hampshire oyster-license holders was conducted. The study objectives included the following: (1) determine the socio-economic characteristics of the people who harvest oysters; (2) determine how the area restrictions affected their oyster-harvesting activities; (3) determine their perceptions about the safeness of eating Great Bay oysters; and (4) assess their attitudes toward (a) oyster depuration which could ensure safeness of oysters for consumption, and (b) management of oyster beds which could maintain or increase the oyster population.

The names of license-holders were obtained from the N.H. Fish and Game Department. The mailing list contained the names of 771 individuals who paid for a license in 1989 plus those of thirty people who had permanent licenses¹. Of the 801 questionnaires sent out in the first mailing, 240 were returned. A second mailing to the non-respondents resulted in an additional 126 responses for a total of 366, or a response rate of forty-six percent.

¹ Those who obtain a New Hampshire oyster-harvesting license when they are 68 years old obtain a permanent license that allows them to harvest oysters in succeeding years without paying a fee.

Summary of Findings

Characteristics of Oyster Harvesters

The survey results suggest that recreational oyster harvesting is pursued mostly by older men. Ninety-five percent of the respondents were male, and sixty-two percent were fifty-five years old or older. Only ten percent of the respondents were below thirty-five years in age, and only two respondents were younger than twenty-five years.

On the surface these figures may imply that this activity may be in danger of dying out. But an analysis of the ages of people who went oyster harvesting for the first time in the period 1984-89 reveal that a high proportion took up this pastime when they were older than fifty-five years. It appears that people tend to pursue other forms of recreation when they are younger and some go into oyster harvesting in their later years.

Thirty-eight percent of the respondents had been harvesting oysters for fewer than five years, 19% for six to ten years, and 25% for more than 20 years. Those in the 55 to 67 years age group predominated in each length-of-harvesting-experience category. Seventy-five percent had an annual income of at least \$20,000, and 60% had a higher than high school education.

Effects of the Closing of Some Oyster Beds

Respondents were asked for information on the following factors before and after closing of some parts of the Bay: number of oyster-harvesting trips per year, time it took to harvest one bushel of oysters, amount of annual harvest, size of oyster-harvesting party, mileage from home to place of harvest, boat fuel used per trip, and time it took to reach the oyster bed from the respondent's boat mooring. The closing of some parts of the Bay appear to have had an effect on most of the oyster-related activities of the respondents. The changes in the average number of trips per year, the average time it takes to harvest a bushel of oysters, and the average amount harvested per year were statistically significant. Respondents took, on average, about one fewer trip in 1989 than before 1988 and they also took about six minutes longer to gather one bushel of oysters. The average quantity harvested was lower by almost one bushel in 1989 than in the years before the closing of some oyster beds.

The changes appear to be minor, but it must be emphasized that at the time of the study only about two years have elapsed since the imposition of area restrictions. The long-term effects could potentially be more significant.

Perceptions as to Safeness of Eating Oysters

Respondents generally believed that Great Bay oysters were safe to eat; however, more people felt they were safe to be eaten cooked (91%), rather than raw (55%). This safe perception was confirmed by their answers to the question as to which they considered safer health-wise, eating oysters purchased from stores or consuming oysters they harvested themselves. Only 9% of the respondents felt that purchasing is definitely safer than harvesting. Fifty-two percent felt that Great Bay oysters are safer; and 39 percent felt that both are equally safe.

Ninety-nine people who believed that harvested oysters are as safe as purchased oysters gave their reasons for that perception: 27% said that Great Bay oysters are tested by the N.H. Fish and Game Department², and 18% said that they believe Great Bay is a safe oyster source while they do not know the pollution status of other oyster sources.

One hundred seventy respondents who thought that harvested oysters are safer than purchased oysters cited their reasons: Forty-six percent said that because they harvested their own oysters they were sure about their freshness. Forty-four percent said that they know the pollution status of Great Bay and they are confident that the oysters from the open area are safe to eat. Furthermore, they do not know how polluted the sources are of purchased oysters. Four percent said that the State Fish and Game Department monitors oyster beds and inspects the oysters.

Attitude Toward Depuration

The survey contained a question on whether the license holder would be interested in having oysters that they harvest depurated so that they will meet acceptable health standards. Forty-one percent said they were interested; 59% said they were not interested.

Respondents were asked as to the amount of money they are willing to pay for depuration and 66% answered that they are not willing to pay any amount. They cited the following reasons: 29% said they are not interested in depuration because they like oysters fresh out of the water; 18% said that the real problem is cleaning up Great Bay; and 12% believed that depuration is not necessary because oysters from the open area are safe to eat.

Attitude Toward Contributing to a Fund Dedicated to Management

The problem of potential over harvesting of oysters in the open areas can be addressed by managing the beds to assure that the oyster population remains high or at least enough to sustain the demand. Such activities would not be costless and revenue from licenses may not be enough to support a management program. Survey respondents were asked about their willingness to contribute to a fund earmarked for oyster-bed management.

Fifty-two percent of the respondents said they were willing to contribute; the average amount that they were willing to pay was \$21.00. Those unwilling to contribute cited the following reasons: license fees should be used for oyster-bed management (31%); the costs of oystering are already high (16%); a management program is not necessary because there are plenty of oysters and oysters grow by themselves (12%); and the real problem is cleaning up Great Bay (10%).

The differences in the willingness to pay response in the sample was analyzed with the use of a logit model. It was hypothesized that a respondent's income level, length of oyster-harvesting experience, round-trip distance from the respondent's home to the oyster bed, and the change in average harvest per trip would affect the probability of that respondent's willingness to pay a positive dollar amount for oyster depuration. The model specification is as follows:

$$\ln \frac{(\pi_{ijkl})}{(1-\pi_{ijkl})} = \mu + \gamma_i + \beta_j + \delta_k + \epsilon_l$$

where π_{ijkl} is the probability of a respondent's willingness to pay a positive amount for oyster management when the

²/Contrary to some respondents' perception, the N.H. Fish and Game Department does not test oysters for the presence of contaminants or monitor water pollution levels in the open area.

respondent's annual income (Y) is i (i=1, \$20,000 or less; 2=greater than \$20,000), length of oyster-harvesting experience (E) is j (j=1, less than or equal to 15 years; j=2, more than 15 years), round-trip distance (D) from home to the oyster bed is k (k=1, less than or equal to 50 miles; k=2, more than 50 miles), and change (C) in average oyster harvest per trip from before 1988 to 1989 is l (l=1, greater than or equal to zero; l=2, less than zero); μ represents the mean of the logits (the dependent variable) for all combinations of the independent variables; and β represents the effect on the logit of each category of the independent variables. The model was estimated using the SAS CATMOD procedure because the independent variables were measured on a categorical scale.

The results (Table 1) indicate that the probability of a positive willingness to pay response is associated with the respondent's annual income level and length of oyster harvesting experience. The probability of a positive response decreases when the respondent's income is smaller than \$20,000 a year. Similarly, the probability decreases when the respondent has been harvesting oysters for fifteen years or fewer.

Table 1. Maximum Likelihood Estimates of Effects of the Independent Variables on the Probability that the Amount a Respondent is Willing to Pay for Oyster-Bed Management is Greater than Zero

Parameter	Coefficient	Std. Error	Chi-Square
Intercept	-0.26	0.17	2.46
Income	-0.38*	0.14	7.76
Experience	0.46*	0.13	12.81
Distance	0.05	0.13	0.13
Change	0.10	0.13	0.56
Likelihood Ratio Statistic=5.73**			

* Statistically significant at the $\alpha=0.01$ level.

** Unable to reject H_0 : There is general association between the independent and dependent variables, at the $\alpha=0.10$ significance level.

Implications

It appears that many respondents were not familiar with oyster biology, particularly in the area of how oysters could become unsafe for human consumption. For example, many license-holders said that they believed that Great Bay oysters were safe to eat because they were fresh. Oysters may be fresh but if they came from polluted waters they may still be unsafe.

It would be helpful to provide those who purchase a license printed information on oyster biology. Information on ways license-holders could help to ensure a viable oyster population could also be included. For example, returning shells into the water would increase the number of oysters by enhancing cultch formation.

Many respondents felt that, because harvesting was allowed in the open area, the oysters were safe to eat. This perception raises some questions: is it a fact that oysters are safe to eat? Are they safe to eat all year, or are there times when one should refrain from taking oysters from the Bay? This issue is highlighted because in some states the regulatory agencies close oyster beds after periods of heavy rain. Runoff increases the levels of coliform bacteria in the waters and in the oysters. Studies that would periodically analyze the safeness of oysters for human consumption, especially after heavy rainfall, would

be helpful to the license holders in making their harvesting decisions.

Based on the survey responses, many license-holders did not understand the oyster-depuration process. An education effort that would explain the procedure as well as its benefits and costs could rectify this situation. The license-holders could then make a better informed decision regarding the usefulness to them of this process.

The survey results show a minor decline in average harvest, as well as slightly more time involved in harvesting a bushel of oysters, after the area closing. These were the effects after only two years; the long-term effects could be greater. Although this does not necessarily indicate that the open area is being over-harvested, it does suggest the need for estimating the total harvest rate in the Bay. This information, together with knowledge about the size of the oyster population and how they thrive under current conditions, would help determine if the existing harvest pressure poses a threat to the oyster population. If over-harvesting is indeed an actual or potential problem, oyster-bed management could be practiced to assure ample quantities of this shellfish in the long run. The survey results indicate license-holder support, and even willingness to pay, for oyster-bed management.

The results of the logit analysis indicate that some care should be exercised in instituting a program that would ask oyster harvesters to contribute to a fund for management. Increasing license fees to raise the money for this purpose may drive some people, those in the lower income categories in particular, out of oyster-harvesting. Although this approach can reduce the demand for oysters and the need for management, it will likely be at the expense of the poorer people. If the objective is to raise funds (not reduce the demand for oyster-harvesting) then other approaches should be considered.

The logit analysis results also show that those who have been harvesting for more than fifteen years are more likely to contribute than those with shorter harvesting experience. Those in the first group are likely to be more familiar with the long-run history of oyster harvesting in Great Bay, and thus perceive a need for management. Perhaps those who have shorter experience could be encouraged to contribute by providing them with information on the history, current situation, and future prospects of oyster harvesting in the Bay.

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MEASURING THE ECONOMIC VALUE OF WILDLIFE: A CAUTION¹

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Wildlife values appear to be very sensitive to whether species are evaluated separately or together, and value estimates often seem inconsistent with neoclassical economic theory. Wildlife value estimates must therefore be used with caution. Additional research about the nature of individual value structures for wildlife is needed.

Introduction

Attempts to derive economic values for wildlife are undertaken for a variety of reasons. The earliest studies focused on the value of wildlife to "users," such as hunters. Shortly thereafter the ecological sciences brought attention to the importance of species that have no traditional "use" value. Economists responded with the suggestion that wildlife might produce several types of "nonuse" or existence values. Krutilla (1967), for example, argued that people often value natural resources that they have no desire to ever actually use or see.

Empirical evidence has tended to confirm Krutilla's hypothesis (see Boyle and Bishop, 1987); in fact, nonuse values may often be the most important component of total economic value. Information about nonuse value is becoming increasingly important because litigation for environmental damages frequently requires it, and because the opportunity costs of wildlife preservation continue to grow. But as the scope of valuation expands, new problems emerge, and wildlife value estimates continue to be viewed with skepticism (see Sagoff, 1988).

This paper examines the validity and meaning of wildlife value estimates derived from the contingent valuation method (CV).² CV is the only method which can estimate both "use" and "nonuse" values. However, CV results often appear to be very sensitive to whether a natural resource is valued on its own or as part of a more inclusive category. Another concern is that since decisions about wildlife often involve ethical or moral considerations, many people may be unwilling or unable to assign meaningful economic values to wildlife.

These problems suggest that wildlife value estimates must be used with caution. We conclude that better information is required about the nature of individual value structures for wildlife and about "what goes on in peoples' minds" when they respond to CV questions.

Concepts of Economic Value

Some wildlife species have market value, and both implicit and explicit economic values are derived from the recreational opportunities associated with wildlife. However, these measures do not necessarily capture all aspects of public preferences and valuation; a more complete valuation includes "nonuse" or existence values.

Weisbrod (1964) and Krutilla (1967) introduced the notion that economic value may accrue to individuals not actually using wildlife. Weisbrod suggested that in an uncertain world "nonusers" might pay an option price to retain the possibility of future use while Krutilla argued that people often value natural resources that they have no desire to ever actually use. Several motives for Krutilla's existence value have been suggested: some may value the knowledge that the resource is available for the enjoyment of others, some may wish to leave an endowment or bequest to future generations, and some believe that natural resources have intrinsic value independent of any benefit or harm to humans.

There is, however, substantial debate about the structure of individual preferences which give rise to these values. Loomis (1988) suggests a general form of an interdependent utility function:

$$U_a = F_a(f_{1a}(X_a, R_a) + f_{2a}(Q_a, (R_a, Q_b)))$$

Where U_a is a weakly separable function relating the utility of individual a to a 's own consumption of private goods, X_a ; a 's use of the natural resource, R_a ; knowledge that other people (represented by b) are able to use the resource, R_b ; personal satisfaction from knowing that the resource exists, Q_a ; and the knowledge that others derive satisfaction from knowing that the resource exists, Q_b .³

The total resource value in this formulation consists of several self-interest and altruistic components which can be held simultaneously by each individual. These components can be aggregated into three main categories; (1) personal use values (including option value); (2) use by others (including bequest separability means that the marginal rates of substitution between goods purchased in the market, X , are independent of Q and consequently contingent valuation is the only technique capable of measuring these values.

Many important questions about the valuation of wildlife remain. Two problems are of primary concern here. First, strong embedding effects have frequently been observed in which the value of a natural resource is much larger when evaluated on its own than when valued as part of a more inclusive category (Kahneman and Knetsch, 1990). This result is inconsistent with neoclassical economic theory unless people are willing to pay a large portion of their income (or budget) or unless the natural resources contained in R_a, R_b are

¹/ This research was sponsored, in part, by the Forest Service, U.S. Department of Agriculture.

²/ Contingent valuation uses survey questions to elicit the maximum amount individuals would be both willing and able to pay for wildlife.

³/ The bundle of private goods, X_a , can include wildlife related commodities, such as books and televised nature programs. Each individual is assumed to have a unique set of tastes and preferences which change over time with experience, development of skills and learning. The current preference structure is therefore directly related to previous use and experience (Randall and Stoll, 1983).

close substitutes. Neither condition is likely and as pointed out by Kahneman and Knetsch, "...if the value (of a resource) is much larger when it is valued on its own than when it is evaluated as part of a more inclusive package of public goods, which measure is the correct one?"

Other problems arise from the public good nature of nonuse values associated with wildlife.⁴ Economic theory often fails to explain individual behavior about the provision of public goods. Examples abound: Why do we contribute to public broadcasting when we know that others will contribute, and if we do contribute, how do we decide on how much?

Several competing theories attempt to explain cooperative or "social" behavior related to the provision of public goods. Margolis (1982) purposes a dual utilities model to explain how individuals allocate resources (income, time, etc.) to satisfy preferences for both public and private goods. Preferences for public goods are assumed to be irreducibly distinct from those associated with private goods; there is no "grand maximand." Rather, Margolis suggests that individuals attempt to seek a balance or "fair share" allocation between private goods and social spending. CV results might therefore represent individual's judgements about paying their "fair share" as opposed to the economic value of the goods in question.

Another perspective is presented by Hollander (1990) who argues that individuals gain social approval by contributing toward the provision of public goods. As a result, willingness to pay represents the combined value of "social approval" and of the good itself. Frank (1987), Sen (1979), Elster (1989) and Edwards (1986) suggest that individuals attempt to maximize programs. Each individual is assumed to have a unique set of personal satisfaction subject to constraints imposed by social norms and commitment to moral duty. Edwards (1986), for example, argues the need to identify CV respondents with ethical preference structures. According to Edwards, ethicists may be motivated by commitment to the existence of wildlife "...rooted in what one thinks as being right or wrong from a moral or ethical point of view regardless of how one's own welfare might be affected" (Edwards, 1986, p. 147). Some CV respondents might therefore refuse to make tradeoffs between money and wildlife. A more important concern, however, is that some ethicists might be willing to pay, but the amount might not represent economic value in the usual sense. Kahneman and Knetsch, for example, argue that CV responses "...reflect the willingness to pay for the moral satisfaction of contributing to public goods, not the economic value of these goods." Opaluch and Segerson (1989) and Harper (1989) take a slightly different view and argue that choices involving moral principles produce conflict and ambivalence which results in avoidance (nonresponse to CV questions), and use of simple lexicographic decision rules about monetary commitment.

A fundamental concern about wildlife valuation which emerges from this brief review is that economic values derived from CV may not be comparable (if significant nonuse values are involved) with those associated with other goods and services. CV respondents may be "paying" for social approval, for moral satisfaction, or their "fair share." Therefore, CV results may frequently be misinterpreted. Yet there is little empirical

evidence about whether or not CV respondents assign meaningful economic values to wildlife. This issue is examined below.

Empirical Evidence

A CV survey about the value of bald eagles and wild turkeys in New England was mailed to 1,500 randomly selected households in the spring of 1989.⁵ The survey included introductory information, general questions about outdoor activities and the importance of wildlife, valuation questions, and several follow-up questions to examine individual decision making processes and the consistency of results obtained from the valuation question. The total design method suggested by Dillman (1978) was followed throughout.

Most respondents reported very limited contact with bald eagles and wild turkeys. Only 25 percent had ever seen these animals in New England, yet 53% of respondents considered the existence of bald eagles in New England to be very important. Existence was somewhat important to 36%, and not important to only 11%. Wild turkeys were considered very important by 41% and somewhat important by 40%.

When asked why bald eagles are important, only 12% of the respondents indicated a personal use value, while 80 percent indicated some type of nonuse or existence value; either giving others a chance to view eagles (16%), to insure that eagles are available for future generations (23%), or an intrinsic value, "because eagles have a right to exist" (41%).⁶ Consequently, nonuse or existence values are likely to be very important components of the total economic value of these species.

For economic valuation, the sample was partitioned into three groups, each of which received an identical questionnaire except for the valuation question. The first group received a valuation question about bald eagles. The second group was asked about bald eagles and wild turkeys combined, and the third group was asked about wild turkeys. The economic valuation question confronted each individual with a specified amount of money, N (randomly selected within fixed intervals over a range of \$5 to \$150), which she/he could contribute to ensure wildlife existence. Respondents were then given an opportunity to bid an amount less (or greater) than the stated value, N . For example, the bald eagle valuation question was specified as follows:

Wildlife management efforts sponsored in part by state, federal and local governments have helped to return some wildlife species from the brink of extinction. The bald eagle and the wild turkey, for example, have both been brought back to New England. Suppose that budget cuts eliminate these programs and that a private trust fund for the management of the bald eagle is set up to preserve and protect the bald eagle population in New England. Please assume that the bald eagle will not continue to exist in New England unless this fund is created. Would you contribute N \$ per year over the next five years to this fund?

⁴ Existence is a pure public good; one individual's enjoyment of existence does not reduce that of another. Consequently, $Q_a = Q_b$.

⁵ Preliminary results from this data were discussed at the 1990 NERR meeting (see More, Glass and Stevens, 1990.) 41% and somewhat important by 40%.

⁶ A comparable question was not asked about wild turkeys.

This formulation may create incentives for "free riding." An individual could, for example, refuse to pay, hoping that everyone else might contribute. Incentives for free riding in contingent valuation are often minimized by using payment vehicles, such as taxes, which exact payment from everyone. Taxation was not used in this study for several reasons. Given the prevailing political climate, tax vehicles might have created strong incentives for protest and nonresponse. Voluntary payments, on the other hand, closely correspond to commonly experienced methods of contributing to wildlife preservation. Moreover, little evidence of free riding behavior has been found in previous studies, and a donation vehicle is quite realistic in light of recent budgetary problems facing many New England communities.

Results obtained from the donation vehicle must, however, be carefully interpreted. Some respondents may view this valuation question more as a way to express a desire for wildlife preservation than as a measure of how much they would actually pay. Other responses may reflect the satisfaction of contributing to a "good cause" rather than the value of the resource itself. Respondents were therefore asked a series of follow-up questions about why they were or were not willing to contribute.

The survey response rate was 37 percent which is slightly below average for academic surveys of the general population (Loomis, 1987). Average bids, maximum bids and standard deviations for each species are reported in Table 1. The average respondent was willing to pay \$21.25 annually for bald eagles,

Table 1. Statistics for Amount Bid

Species	Mean Amount Bid (\$ Per Year)	Standard Deviation	Maximum (\$)
Bald Eagles	\$21.25	38.36	200
Wild Turkeys	\$11.67	27.34	150
Bald Eagles & Wild Turkeys Combined	\$9.00	16.23	75

\$11.67 for wild turkeys, and \$9.00 for bald eagles and wild turkeys combined. However, since many respondents refused to place a dollar value on wildlife, these values must be adjusted. Over 80 percent of survey respondents said that bald eagles and wild turkeys are either very or somewhat important to them, but a majority of respondents, 62 percent, would not pay any money for restoration. When asked why, 40 percent of those refusing to pay protested the method of payment used in this CV; they stated that these species should be preserved but that the money should come from taxes or license fees. Twenty five percent protested for ethical reasons; they said that wildlife values should not be measured in dollar terms. Only 6 percent of those not willing to pay said that these species were worth nothing to them.⁷ This implies that the average values in Table 1 are underestimated and when protest responses were removed from the data set the average respondent was willing to pay

⁷/ Protest bids are quite common in contingent valuation. For example, Desvousges, Smith and McGivney (1983) identified nearly half of the zero bids in their study of water quality as protest bids.

about \$31 per year for bald eagles, \$18.85 for wild turkeys and \$13.12 for bald eagles and wild turkeys combined (see Table 2).

Table 2. Adjusted Statistics for Amount Bid

Species	Protest (%)	Mean Amount Bid (\$ Per Year) (without protest)	Standard Deviation	t*	t**
Bald Eagles	31	\$30.81	42.99	2.56	1.36
Wild Turkeys	38	\$18.85	35.55	1.01	
Bald Eagles & Wild Turkeys Combined	31	\$13.12	18.21		

* Compared to Bald Eagles & Wild Turkeys combined.

** Compared to Wild Turkeys.

The value estimates for bald eagles and wild turkeys seem "reasonable" when compared to previous research findings (for example, see Boyle and Bishop, 1987). The adjusted willingness-to-pay results also appear "reasonable" when compared to actual donations made by respondents during the previous year. Evidence obtained from follow-up questions showed that 32% of the respondents had actually made donations for wildlife preservation during the previous year; the average being approximately 70 dollars. However, the average value for bald eagles and wild turkeys combined was much less than when each was valued separately and added together. Moreover, the value of the "t" statistic in Table 2 suggests that this difference is statistically significant, which casts doubt on the validity and meaning of these value estimates.⁸

Further analysis revealed other potential problems with these value estimates. Many of those who were willing to pay expressed attitudes about wildlife which, when viewed from the perspective of neoclassical economic theory, appear "irrational." For example, forty-four percent of all respondents agreed with the statement that "preservation of wildlife should not be determined by how much money can be spent," and 67% of all respondents agreed with the statement that, "As much wildlife as possible should be preserved no matter what the cost." These respondents may have failed to give meaningful responses to the willingness-to-pay question, and when the bids by respondents who strongly agreed with these statements were also removed from the data, the average respondent would pay \$25.35 for bald eagles, \$18.90 for wild turkeys, and \$10.66 for bald eagles and wild turkeys combined.

Regression analysis was used to obtain additional evidence about the decision-making behavior of survey respondents. The dependent variable was the actual dollar amount respondents would pay. Independent variables included dummy variables for region of residence (S), membership in environmental organizations (ORG), type of residential neighborhood (U), and whether or not the respondent hunts or has hunted (H).

⁸/ No significant differences were found in the distribution of the initial bid "N," or of the socio-economic or demographic characteristics of respondents between groups which might explain this result.

Variables for amount of money actually donated for wildlife preservation during the previous year, the initial amount asked for, N, and for the respondent's age, education and income were also included. The data from the three subsamples were pooled and dummy variables were used to represent survey type (D1=1 if bald eagle, D3=1 if bald eagles and wild turkeys combined).⁹ The results presented in Table 3 show a statistically significant relationship between payment and the variables representing hunting, education, previous donation amount, and the initial bid, N. Hunters and respondents with more education were willing to pay a greater amount and payment increased with the amount actually donated.¹⁰ However, this model does not adequately describe how individuals responded to the CV question because it explained very little of the variation in willingness-to-pay ($R^2 = .15$ to $.17$).

Table 3. Regression Model Results

Variable	All Data		Data with Protest Deleted	
Constant	-1.03	(.11)	-1.48	(.11)
D1	9.28	(1.89)*	12.26	(1.75)*
D3	-.72	(.15)	-2.48	(.37)
S	6.80	(1.47)	9.40	(1.42)
U	2.87	(.61)	1.40	(.22)
H	11.50	(2.56)**	16.61	(2.60)**
ORG	-2.05	(.41)	-1.80	(.26)
Age	-.09	(.75)	-.21	(1.21)
Education	11.64	(2.58)**	16.00	(2.37)**
Income	-2.41	(1.42)	-1.59	(.66)
Donation (\$)	.08	(3.72)**	.07	(2.79)**
N(\$)	.08	(1.84)*	.11	(1.89)*
R ²	.15		.17	
N	191.00		127.00	

"t" statistic in parenthesis (absolute value)

* significant at .05 level (2 tail)

** significant at .10 level (2 tail)

Summary and Conclusions

The results suggest a substantial economic benefit associated with bald eagles and wild turkeys in New England, most of which is attributed to some form of nonuse value. Consequently, nonuse or existence values cannot be ignored in economic analysis. Yet, evidence from the follow-up questions raises several concerns about the meaning and validity of CV value estimates.

The value estimates were very sensitive to whether or not species were evaluated separately or together; the value of bald eagles and wild turkeys combined seems logically inconsistent with the results for bald eagles alone. The survey response rate was relatively low (37%) and many respondents protested the CV. They believed that wildlife should not be valued in dollar terms or that the money should come from somewhere else (taxes and license fees). Furthermore, a majority of those who

would pay exhibited behavior which appears inconsistent with the neoclassical economic theory of tradeoffs between money and wildlife.

My principle concern is that we know very little about how people interpret CV questions and even less is known about their decision making strategy in CV. Consequently, we cannot be very certain about the meaning of the CV results. One explanation for the results reported here is that questions about wildlife existence created ambivalence among respondents resulting in nonresponse, protest, and lexicographic behavior. This implies that wildlife values were underestimated.

Another possibility is that individual decisions about monetary commitment might be based primarily on social, cultural, or moral (as opposed to economic) considerations. According to Sagoff (1988), many people believe that natural resources should be managed on the basis of normative, political, and cultural grounds, rather than from an economic efficiency perspective. Moreover, proponents of environmental ethics argue that wildlife have a right to exist independent of human attitudes toward their existence. Consequently, we might expect that CV respondents would often fail to make meaningful tradeoffs between money and wildlife.

Questions about the extent to which these results measure the economic value of wildlife remain unanswered. The monetary values reported here might measure the value of wildlife, they might reflect the amount of money which could be raised through private donations, or they might simply indicate the value of contributing to a "good cause."

These difficulties raise several obvious concerns about the meaning and validity of wildlife value estimates. Because very little is known about the process used by individuals in making choices about public goods involving altruism, ethical commitments, moral considerations, and ambivalence, we must investigate how individuals interpret CV questions. Wildlife value studies should include follow-up questions to examine the quality and nature of respondents' decision making processes; questions about motivation should be used to cross-check the valuation results; and, nonmonetary preference scales should be used in conjunction with economic valuation questions. As suggested by Smith (1985), "we must learn to communicate with the individuals we wish to interview. This will often mean asking them what they think we are asking for!"

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⁹ The model was estimated with two sets of data (protest responses included and excluded). The results remained relatively stable when protest responses were omitted (see Table 3).

¹⁰ Since payment increased with N, some starting point bias may have occurred.

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FISHERIES AND WILDLIFE

FISHING SPECIALIZATION

TOWARD A COMPREHENSIVE UNDER- STANDING OF ANGLER INVOLVEMENT

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This paper synthesizes recent Cornell University studies on recreation involvement, with special emphasis on fishing. It examines angler involvement from a broader perspective that includes goals/motives for involvement, and changes in these goals that may occur over time, or even from one experience to the next.

Introduction

The development of a more complete understanding of angler involvement is both a topic of great interest to management agencies and a substantial academic challenge. At the state level, anglers provide substantial revenues for fisheries programs through their purchase of fishing licenses. Because of their interest in their sport, anglers frequently provide meaningful lobbies for water quality enhancement, the protection of fish habitats, and stocking policies that fully utilize potential fishery resources. Angler groups frequently take strong positions on a variety of issues, ranging from the mixture of species stocked in particular waters to allocation decisions between commercial and sport fishing interests. While issue-oriented surveys may adequately portray where a given group of anglers stands on a particular issue at a specific point in time, fisheries agencies need a broader and deeper information base for comprehensive planning efforts. Central to this information base is a better understanding of fishing involvement. By "involvement", we mean motivations for fishing, satisfactions sought from the activity, and the stability of fishing participation in both an individual and an aggregate sense.

Researchers in the Human Dimensions Research Unit at Cornell University have worked over a period of nearly two decades on analogous questions concerning hunting involvement. As this research progressed through the latter half of the 1980s, we became convinced that the approaches we used to examine hunting involvement had direct application to fishing involvement. Research funded by the New York Sea Grant Institute and the New York State Department of Environmental Conservation have allowed us to conduct recent inquiries into fishing involvement. This paper presents a synthesis of some of that research.

Methods

The framework for examining fishing involvement parallels that used for hunting involvement (Decker et al. 1987). In brief, this framework involves a goal-driven model that presumes that a particular form of recreation activity such as fishing, or more specifically, a Lake Ontario salmon boat-fishing trip, is considered by the angler or the angler's friends or family as a means of satisfying certain goals. A variety of intervening influences, both personal or internal and social or external, mediate along with situational factors such as weather and available time to affect whether and when the proposed

activity or outing is actually pursued. This and other models have been formulated by researchers to explain whether or not individuals will initially try or adopt a new activity. However, we have proposed that this goal-driven model operates not just initially in the case of someone who chooses to try salmon fishing for the first time, or when an experienced participant decides to take a boat fishing trip rather than to play golf on a specific Sunday afternoon. It also operates temporally in reference to a particular activity, from the development of initial interest to trying the activity, pursuing it, adopting it as an activity to pursue regularly, continued pursuit of the activity, and eventual desertion from the activity. Discontinuation is possible at any stage, however.

The concept of personal investment theory (Maehr and Braskamp 1986) was also easily integrated into the framework for fishing involvement and made the framework more robust. Maehr and Braskamp portray a "personal investment-product-evaluation triangle" operating over time in which individuals (not necessarily in a leisure setting) make a personal investment of time, energy, and resources in some type of product or activity (e.g., a place of employment, further education, a particular type of vehicle) and periodically evaluate that investment in deciding whether or not to continue it. This portrayal is entirely consistent with our previous temporal model of pursuing a recreation activity, described above. Personal investment can also be viewed as the decision to invest in and pursue a particular type of recreation activity such as fishing. Maehr and Braskamp note that similar external and internal factors as those noted in the Decker et al. (1987) model affect the motivation that results in particular personal investments. Maehr and Braskamp also note three general types of outcomes from personal investment as achievement, personal growth, and life satisfaction. While somewhat different as itemized from the overall satisfaction concept and its various components that are found in recreation research, we still find personal investment theory to be a concept that enriches our previous framework and have therefore integrated it into our work in fisheries research. Personal investment theory was used previously in a study of Indiana and Illinois Great Lakes anglers (Absher and Collins 1987).

This paper draws upon several recent fisheries studies. These include studies of Lake Ontario salmonid boat anglers (Siemer et al. 1989a, 1989b), a statewide mail survey of licensed New York anglers (Connelly et al. 1990a), and a study of Salmon River salmon anglers (Connelly et al. 1990b). The Lake Ontario salmonid boat angler survey was conducted in two phases consisting of in-depth personal interviews which were tape recorded for further analysis, and a mail survey to a random sample of 1,101 boat owners who registered a boat for primary use in one of five counties bordering western or central Lake Ontario (437 respondents had fished Lake Ontario by boat in the previous two years). The 1988 New York statewide angler survey involved a mail survey with responses from over 10,000 anglers about fishing activity, motivations for fishing, and valuation of fishing, among other topics.

This synthesis is divided into segments dealing with various aspects of fishing involvement. After presenting overviews of findings from our studies, we examine gaps in knowledge that remain and suggest areas of research that should prove fruitful.

Motivations for Fishing

Preliminary interviews of Lake Ontario boat anglers indicated that achievement, affiliation, and appreciation, motivations shown by previous research to be important to hunting (Decker and Connelly 1989), were each important to fishing. As a result

boat anglers were asked in the mail survey specifically about the importance of deriving these three types of satisfaction from fishing. The majority of respondents indicated that each was at least moderately important, although 39% indicated that achievement had little or no importance. However, factor analysis using principal components extraction showed five motivational groupings of these boat anglers for recreation activities generally (challenge, accomplishment, affiliation, escape/appreciation, and novelty), and four motivations for fishing generally (challenge, accomplishment, affiliation/appreciation/escape, and novelty). Somewhat different individual components were used for hunting than fishing. As a result, some of the domain included by "accomplishment" for boat anglers overlaps with the domain termed "achievement" by Decker and Connelly. However, the novelty factor uncovered for these recreationists both for recreation generally and for salmonid boat angling has received little previous attention in the literature for fishing, and did not appear to be important in exploratory interviews of hunters (Decker et al. 1984).

The presence of a novelty-related factor for fishing was also confirmed in a statewide study of New York anglers (Connelly et al. 1990a). Among a broader group of respondents that included nonresidents as well as residents of New York, five factors were identified by factor analysis: catch, appreciative/affiliative, eating fish, solitude/exploration, and new skills. While the individual scale items did not factor out in a manner that different components related to achievement or accomplishment grouped together, it seems clear that catching fish was very important to this diverse group of anglers. A majority (55%) indicated that catching at least one fish was essential to a satisfying fishing experience. Catching several fish and catching large fish were rated as important by a majority of respondents. The factor "eating" included not only catching fish to eat, but fishing in areas where fish are safe to eat. The latter item was rated essential to a satisfying experience by 66% of respondents, the highest rating received for any item in the scale. The factor "solitude/exploration" included fishing where there are few people and exploring new fishing areas. The factor "new skills" received high factor loadings for trying out new gear and for mastering fishing skills and thus appears to overlap at least partially with the novelty domain found in the Lake Ontario boat-angler survey.

One would expect motivations of anglers who engage in or prefer specified types of fishing to differ from those of other anglers. Siemer et al. (1989b) found that Lake Ontario boat anglers who participated in fishing tournaments had much higher mean factor scores for challenge and accomplishment than those who did not participate in tournaments. Similar results were found for those who had snagged for salmon in tributaries versus those who had not. A subset of highly invested anglers was also defined on the basis of years of fishing experience, days fished in 1988, and whether or not salmon fishing was their most important recreation activity. These highly invested anglers had mean scores for each factor that were significantly higher than those of anglers who were less invested.

Bryan (1977) identified for fishing and Jackson et al. (1979) identified for hunting stages of specialization or maturation that they felt these recreationists pass through over time. To the extent that these groups pass through stages, and regardless of whether some type of hierarchy such as increased specialization or appreciation of the total outdoor experience is involved, Cornell researchers have hypothesized that this represents behavior that is at least in part situationally determined or

influenced and represents a more basic change in goals and motivations for fishing experiences. While we do not have longitudinal studies, we do have limited evidence for this from studies where we have asked recreationists to compare current motivations for participation with those in the past. In the Lake Ontario boat angler study, where anglers had a mean of 16 years experience fishing this lake, respondents reported increased interest or importance since they started fishing in maintaining the fishery (74%), enjoyment of nature (70%), catch-and-release fishing (69%), fishing method (65%), learning the habits of salmonids (64%), catching trophy fish (54%), and the surroundings while fishing (53%). Overall interest and importance had stayed at a similar level for specializing for certain species, using lighter tackle, teaching others to fish, and catching fish. For the vast majority, the importance of catching fish to eat and limiting out had either stayed the same or decreased.

This general concept was also tested by dividing respondents into 3 groups according to years of experience at salmonid fishing (2 - 5 years, 6 - 10 years, and 11 - 15 years) and examining the degree to which the groups indicated the above factors had increased in importance since they started fishing. No significant differences (via chi square analysis) were found for the categories enjoyment of nature, catching fish, catching fish to eat, and limiting out. A significant difference was found for surroundings while fishing, probably due to too few observations in several cells; responses to this category were similar for all three groups. For some factors, the primary change in importance was between those with 2 - 5 years experience and those with more experience. That is, the importance did not continue to increase for anglers with 11 - 15 years, versus 6 - 10 years experience. This was true for maintaining the fishery, catch-and-release fishing, fishing method, and teaching others to fish (the latter of which may be related to age of anglers and their children). Several categories showed continuing increases in importance for each of the three age groups: learning salmonid's habits, catching trophy fish, specializing for certain species, and using lighter tackle.

Recreation and leisure scientists probably all suffer at times from a myopia of viewing the total personality and make-up of recreationists in the setting in which they were interviewed or in the context in which they responded to a mail survey. To use our own case as an illustration, we send questionnaires to a sample of registered boat owners, many of whom fish Lake Ontario, and we ask them questions about their motivations for fishing and what constitutes a satisfying fishing experience. Usually we don't ask about one specific trip, so anglers are forced to generalize their responses to a typical Lake Ontario fishing trip. We get information about their fishing for salmonids, and we characterize them as Lake Ontario salmonid boat anglers. Indeed, these people do and have fished Lake Ontario by boat for salmonids, most for a number of years.

What we tend to forget in our eagerness to classify these anglers into meaningful motivational or other slots is that their fishing "personality" is probably much more diverse and complex than this data snapshot leads us to believe. In fact, the data themselves indicate this. Some of these salmonid boat anglers (15%) also snag for salmon in tributaries. Some (60%) enter salmonid fishing tournaments. Some (21%) go fly fishing in streams, probably outside of Lake Ontario tributaries. While we don't have further data from this study, we know from the statewide studies of anglers who fish in New York that most anglers over the course of the year fish several bodies of water, use several types of fishing gear to fish for a variety of fish species. Often these fishing sites vary considerably not only in

terms of species available, but also as to how remote they are from population centers and development, how crowded they are, how aesthetic their surroundings appear, whether one would fish from shore, from a boat of varying size, etc. In short, most would agree that some of these sites would provide very different experiences.

We would hypothesize that anglers who choose very different fishing experiences over the span of relatively short time periods have different motivational sets and hence different expectations of those experiences. This probably needs to be extended even further, however. Anglers probably have different motivational sets at different points in time specifically for boat angling on Lake Ontario. As an illustration, on one occasion, an angler may go out with his family and concentrate on improving the fishing skills of the children and trying to catch a lake trout. On another occasion the same angler may be fishing with skilled friends and be pursuing trophy-sized chinook salmon. On the first trip affiliative motivations may prevail, while on the second trip challenge and accomplishment motives may prevail. Appreciation/escape and novelty aspects may be meaningful secondary motives for both experiences. This is consistent with the findings of Allen and Donnelly (1985) that strong relationships exist between social units of participation and reasons for participation. It is also consistent with information provided in focus groups by Salmon River anglers, who indicated that their goals and expectations changed within a given day as they moved back and forth from snagging to nonsnagging sections of the river to fish for salmon by different methods (Connelly et al. 1990b).

While further research is clearly needed, the above arguments would refute the idea that anglers could be classified as being in a single goal or motivational stage. It would also refute the notion that anglers unidimensionally move through stages of fishing in which they never "regress" to a previous stage. Although this view makes motivational analysis more complex, it does not detract from the usefulness of understanding and quantifying the motivational sets or expectations of anglers concerning particular fisheries. A better understanding of these allows fisheries managers to either manage resources consistently with those expectations (to the degree that sound resource management allows this), or to mount educational programs to try to place expectations in line with resource realities. A better understanding of these angler motivations is also helpful to the private sector in providing facilities, equipment, and services that would enhance these fishing experiences.

The finding that many anglers over time develop a greater concern for maintaining the fishery and for learning more about the habits of the species they fish for may be related not only to their experience but to their personal investment. That is, as anglers spend more time fishing a particular resource and purchasing equipment to facilitate fishing, they gradually become more invested not only in the fishing experience, but in the resource itself. Although not well researched, this is closely related to a general premise of fisheries managers over the decades, namely that actively involved anglers will be spokespersons for maintaining quality fishery resources.

Temporal Involvement in Fishing

Temporal involvement in fishing is of strong interest to both resource management agencies and the private sector, and is fertile ground for academic research. As suggested above, fisheries management agencies depend on anglers not only for a portion of program revenues, but also to be lobbyists for a

clean environment in which fishery resources are protected and, where possible, enhanced through stocking or habitat improvement. The development of the Great Lakes salmonid fisheries has provided economic expansion opportunities for the boating and marine trades industries, and in many localities for lodging, restaurant, sporting goods, and other services. Some of these businesses have large capital investments, however, and owners as well as financial institutions want to know whether to expect continued long-term growth, stability after a period of growth, or a fad that declines substantially in a few years, as was the case of snowmobiling in New York a decade or so ago.

Limited work has been done on temporal involvement in fishing, but several researchers have put forth frameworks for studying involvement in or commitment to recreation activities. Brandenburgh et al. (1982) developed a conceptual model of recreation activity adoption in which initial preoccupations and interests are coupled with each of the conditions of opportunity, knowledge, a favorable social milieu, and receptiveness. These prerequisites in combination with one or more key events were often followed by adoption of a recreation activity. Others including ourselves have looked at such market segments as continuous participants, usually defined as those who participate every year for some period, versus sporadic participants who discontinue participation for at least a year but then participate again, and former participants or "drop-outs" who abandon an activity. High, medium, and low-potential nonparticipants have also been identified based on initial interest in activities.

In conjunction with knowing something about the population dynamics of fishing (i.e., rate of entry into and departure from the activity) and demographics and psychographics about the various market segments, it is important to gain some understanding of the dedication or faithfulness that anglers hold toward the sport because this should be correlated both with the likelihood that they will continue participating and that they will be active in support of fisheries issues. Several overlapping constructs have been suggested for measuring this. We have already mentioned personal investment theory. Although no single measure has been suggested for the concept of personal investment, it may include time, education, expenditure of funds, and quite likely a psychological or emotional investment in which one identifies with the activity. Thus, the idea of personal investment has similarities to commitment, a term used frequently in past research and further defined by Buchanan (1985) as the pledging or binding of an individual to behavioral acts which result in some degree of attachment to the behavior or its associated role and which produces side bets (i.e., investments not necessarily associated directly with participation but which will likely encourage continued participation) as a result of that behavior. Commitment denotes among other things an affective attachment to an activity. McIntyre (1989) uses the construct of enduring involvement to denote personal meaning of participation. Enduring involvement, according to McIntyre, has four facets: importance, enjoyment, self-expression, and centrality.

No single index of involvement was developed for Lake Ontario boat anglers. The average angler had boated on Lake Ontario for 16 years, fished for salmonids for about 8 years (stocking of salmonids was interrupted in the latter 1970s because of the contaminants mirex and PCBs), and fished 27 days in 1988, including 11 days for salmon. About 40% expected their participation to increase in the coming year, 46% expected it to remain the same, 7% expected it to decrease, and 3% expected to

stop completely. We defined highly invested salmonid anglers as those who fished for salmonids for at least the mean number of years of all respondents and who fished at least the mean number of days of all respondents in 1988, but who also said they spent more time on salmonid fishing than any other activity and said salmonid fishing was their most important recreation activity. Slightly over one-third of all respondents met this operational definition of being highly invested.

Many of the constructs for measuring commitment or involvement are now available, although they will likely be expanded or refined by other researchers. Complementary to the idea of some tie between ego and identity to fishing as a measure of involvement is that of a sociocultural identity with fishing. For some, fishing has been an important family activity for many years and thus has become a part of their culture. One would hypothesize that people who fit this description would be more likely to continue fishing, regardless of the number of days they fish currently, than others who enjoy fishing and may even be somewhat heavily invested in fishing, but who do not have this cultural attachment to fishing. Thus, anthropological research into cultural meanings and significance of fishing should also be fruitful to providing a fuller understanding of angler involvement.

Summary

Through recent research we have developed a broader conceptual model of investigating recreation involvement that we have applied to fishing. This model recognizes involvement in fishing as a means of meeting certain basic goals that may be related to the individual and/or to social groups of which the individual is a part. These goals may change over time and consequently cause individuals to seek different types of fishing experiences (or activities other than fishing). These goals may also be different at different times for the same type of fishing on the same body of water. The degree to which the goals set for a particular experience are met should largely determine overall satisfaction with the fishing experience. If one accepts these premises, one must reject the notion that anglers can be placed into single stages of fishing behavior at any point in time and that they move into more specialized stages over time from which they never "regress" into previous stages.

Several constructs are currently being used to evaluate angler involvement and the likelihood that given anglers will continue fishing participation. These include personal investment theory, commitment, and enduring involvement. We suggest that each of these constructs, which we believe overlap to a considerable extent, are useful to examining involvement. In addition, an anthropological construct reflecting the degree to which one has been acculturated to fishing should prove useful to predicting continued involvement in fishing.

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THE ANGLER SPECIALIZATION CONCEPT APPLIED: NEW YORK'S SALMON RIVER ANGLERS

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The concept of angler specialization was applied to a study of
Salmon River anglers to test this concept when using a variety
of angling techniques and two species groups within the same
environmental setting. A revision of the concept is suggested
to account for angler expectancy and cognitive processes.

Introduction

The concept of angler specialization proposed by Bryan (1976,
1977, and 1979) states that there were four basic types of
anglers: (1) the occasional angler of novice ability and only
casual interest in the sport; (2) the generalist angler who is
interested in catching some fish in any environment by any
legal method; (3) the tackle-species specialist who specializes
in the skill of a particular angling method and/or angling for a
particular species; and (4) the method-species-setting specialist
who specializes in the method, species, and setting which make
up a particular experience. These angler types are based on
degree of specialization in fishing and specific motives in using
the fishery resource. The four basic types of anglers reportedly
changed their attitudes and motivations as specialization
increased so that their emphasis shifted from consumption to
conservation and natural settings. More specialized anglers
were predicted by Bryan (1979) to: decrease their interest in
harvest motives; increase their interest in non-harvest motives
and specialized fishing equipment; and increase their
dependence on the resource setting "to determine the difference
between luck and skill".

Research on New York's Salmon River (Dawson and Brown,
1989; Connelly et al., 1990) suggests that the concept of
recreational specialization may not hold true for some segments
of anglers. For example, Connelly et al. (1990) reported that 45
percent of steelhead anglers (highly specialized) also
participated in salmon snagging/lifting activities (low
specialization and focused on harvest more than skill) in 1989.
The goal of this paper is to attempt to apply the angler
specialization concept to data available from a 1989 survey of
Salmon River anglers (Connelly et al., 1990). While this data
was collected for other purposes, it provides some information
to test the angler specialization concept and helps illustrate the

need for a revision of the concept. The concern over the general
lack of empirical evidence to support the specialization concept
is outlined in a paper by Dawson, Buerger, and Gratzer (1991) in
this same proceedings.

New York's Salmon River Fishery

The 1989 Salmon River angler survey was designed to measure
angler impacts on the fishery resources, angler attitudes toward
existing and potential fishery regulations, and economic
impacts on the local communities. The study consisted of three
survey components: (1) a streamside creel census of 5,755
anglers to estimate their catch and effort; (2) a mail survey of
1,609 anglers (69% responded) to estimate trip characteristics,
attitudes about salmon fishing, and reactions to potential
changes in salmon fishing regulations; and (3) focus group
interviews with 8 angler groups (115 anglers) to investigate in-
depth reactions to potential fishing regulations and attitudes
about salmon fishing (Connelly et al., 1990).

During August 15 to December 31, 1989, anglers were generally
in pursuit of either Pacific Salmon or Steelhead that were
returning to the Salmon River to spawn after leaving Lake
Ontario. Pacific Salmon return earlier than Steelhead during the
fall season. Pacific Salmon die after spawning and can be taken
by a variety of methods at different times and locations. For
example, as the season progresses, salmon can be taken in
some locations by legally snagging the fish in the body with a
weighted treble hook since the fish will soon die anyway.
Steelhead return later in the fall and winter to spawn; however,
they do not die after spawning and can return to spawn in
subsequent years.

For this study (Connelly et al., 1990), anglers were divided into
three groups based on their fishing methods. Anglers who
claimed to use only snagging methods on the Salmon River in
1989 comprised 17% of all anglers and are referred to as
snagging-only anglers. Anglers who reportedly only used
artificial or bait tackle comprised 40% of all anglers in 1989
and were referred to as non-snagging anglers. The remaining 43
percent of the anglers reportedly used both snagging and non-
snagging methods at some point during the season and were
referred to as mixed-method anglers.

The fishing method definitions used for this study were:

Snagging (or snatching) -- fishing with a weighted treble
hook with the purpose of catching a salmon in the body; this
method is legal for Pacific Salmon during certain days of the
season in specific sections of the river using specific tackle.
Lifting (or lining) -- fishing with a single pointed hook and
with the weight at least 24" from the hook, with the intent of
foulhook a fish or catching it in the mouth; while the tackle is
legal, the technique is not legal for either salmon or steelhead
since the fish is generally foulhooked.

Foulhooking -- snagging or lifting; catching a fish not
hooked in the mouth.

Respondents from the mail survey reported using a variety of
angling methods for both salmon and steelhead. For example,
45 percent of steelhead anglers reported participating in
snagging/lifting activities for salmon and/or steelhead.
Information gathered in the focus group interviews revealed that
some anglers who fished for both salmon and steelhead
expressed different values and expectations when fishing for
each species. The main difference stated was that salmon were
going to die anyway and lifting, lining, and snagging were
acceptable to those anglers. Anglers reported that they tried
different sections of the river within the same day due to the
number of anglers present, number of fish evident, water flow,

and perceived success at catching a fish. Anglers tended to report in the focus group interviews that they used a variety of techniques, fished avidly, and often sought salmon and steelhead in season.

Connelly et al. (1990) reported that during the in-depth focus group interviews "some anglers expressed the view that they evolved or matured from a generalist to a more specialized type of angler who considered foulhooking salmon to be unethical. The more frequent viewpoint was expressed by a more opportunistic type of angler who considered foulhooking as ethical since it allowed for the harvesting of a resource that would otherwise be lost (from their perspective and experience). Generally, these opportunistic anglers stated that they changed their motivations, expectations, and behavior when going back and forth from nonsnagging to snagging for salmon or when going from salmon to steelhead fishing" (p.17).

Angler Specialization Applied

The angler specialization concept reported by Bryan (1979) included a hierarchy from lowest to highest specialization as follows:

- 1) occasional angler;
- 2) generalist angler;
- 3) tackle-species specialist; and
- 4) method-species-setting specialist.

The underlying principles were that an angler progressed from one type to the next and that this was a hierarchical typology.

A parallel typology for New York's Salmon River, from lowest to highest type of angling method and species, may look like the following:

- 1) snagging or lifting steelhead;
- 2) snagging or lifting salmon;
- 3) natural or live bait fishing for salmon;
- 4) natural or live bait fishing for steelhead;
- 5) artificial lure fishing (artificial eggs) for salmon; and
- 6) artificial lure fishing (artificial eggs) for steelhead.

The environmental setting would remain constant for each fishing type since each is practiced on the same river environment.

A cluster analysis (Norusis and SPSS, 1990) of the 1989 angler participation was conducted using the squared euclidean distance method (SPSS/PC+) to attempt to classify the anglers into angler groups with similar participation characteristics. The variables used for classification were the 6 types of angling participation listed above. The participation variables were calculated for each individual based on the percentage of participation within each fishing type and each anglers' total for 1989 was 100%. This approach allowed for a standardization of the measurement unit and minimized the absolute difference between those anglers who had very high or low participation rates in 1989.

The result of the cluster analysis was a five angler group cluster solution based on participation. The centroids of each of the five angler group clusters is shown in Table 1 based on the 6 participation variables. Specialization in fishing participation is conceptualized as increasing from top to bottom and the five angler clusters increase in specialization from group 1 to 5 (left to right).

Table 1. Five group cluster solution for Salmon River angling participation in 1989.

Fishing Participation	Cluster Group Centers				
	Group 1	Group 2	Group 3	Group 4	Group 5
Snag/lift steelhead	2	0	1	0	2
Snag/lift salmon	<u>6.9</u>	6	2	5	4
Natural bait salmon	1	<u>6.3</u>	5	2	2
Natural bait steelhead	4	11	<u>7.0</u>	4	10
Lures salmon	9	21	9	<u>7.8</u>	17
Lures steelhead	9	3	10	10	<u>6.3</u>
Number Cases	366	22	102	237	320

The centroid numbers for each group in Table 1 represent the percent of participation in each fishing method. The trend of the majority of anglers (63 to 78 percent) is toward participation in one primary type of participation and this is evident in the diagonal line (i.e., the majority of participation is underlined) from the upper left to the lower right corner of the table. This suggests that this set of angler experiences generally supports the angler specialization concept. However, the centroid data is highlighted to show that many other angling methods have greater than 5% participation in any given cell. These highlighted cells indicate that anglers may be primarily using one technique but they also move up and down within the specialization continuum both between species and between methods.

The other observation from the cluster analysis is that these classified groups are, in reality, part of a continuum and do not form a clearly defined hierarchical typology as suggested by the specialization concept. The analysis of these "groups" is instructive for the sake of assessing the specialization concept and for reviewing the implications of fishery management regulations on these subgroups of anglers.

Angler Attitude Statements

The angler group responses to several attitude statements and proposed regulations are shown in Table 2. The three attitude statements were based on a Likert scale from strongly agree to strongly disagree. The percentage agree and strongly agree are shown for each angler cluster group in Table 2. Statistically significant differences were found for each of the three variables ($X^2 > 135$, $df = 16$, $P < 0.001$). Group 1, snagging-oriented anglers, consistently has the majority of anglers in support of snagging related statements; the other four groups exhibit the declining support expected as specialization increases from Group 2 to Group 5, with the exception of Group 4 which does not directly follow the pattern.

The response to the two proposed regulation statements were based on the percentage of anglers in each angler cluster group that reported support (Table 2) with the possible response categories of support, oppose, and undecided. Statistically significant differences were found for both variables ($X^2 > 200$, $df = 8$, $P < 0.001$). The percentage of anglers supporting the ban on salmon snagging and ban on foulhooking salmon and steelhead generally increases as expected from Group 1 to Group 5 as specialization increases, with the exception of Group 4 which does not directly follow the pattern.

Table 2. Five angler group cluster agreement regarding salmon fishing attitude statements in 1989.

Fishing Related Attitudes	Cluster Group Percentage Agreement				
	Group 1	Group 2	Group 3	Group 4	Group 5
Salmon will not strike a lure once they enter a stream to spawn	76	50	33	49	24
Snagging is necessary for full use of resource	77	43	40	50	37
Snagging salmon is not inconsistent with good conservation ethics	68	43	33	50	36
<u>Fishing Regulations</u>					
Support ban on salmon snagging	22	32	58	47	61
Support ban on foul-hooking salmon & steelhead	8	32	58	26	51

Conclusions

The specialization concept has some value in fisheries management in assessing Salmon River angler attitudes when the analysis is based on the relative number of anglers and angling participation represented by each of the five angler group clusters, and the diversity of angling techniques used and species sought. What is also evident from this analysis and the focus group interview data (Connelly et al., 1990) is that the specialization concept is too simplistic and needs to better account for the expectations and multi-dimensionality of angler motivations.

A motivational model that appears more appropriate to apply in recreational settings is expectancy theory (see Dawson, Buerger, and Gratzner, 1991 in this proceedings) which includes cognitive processes as central to the behavior decision-making/involvement process experienced by anglers. Cognitive theory approaches the motivation phenomenon from the perspective of expectancy whereby behavior is influenced by past outcomes but is more selective in anticipation and ascribing response-outcome probabilities than is the specialization concept (reinforcement theory). For example, an angler who highly values catching a salmon and has confidence in his/her ability and specialized equipment perceives that a reasonable amount of effort has a low probability of catching a fish, then he/she will either not engage in the activity or will change the setting or equipment to increase expectancy. This may be an explanation for Salmon River anglers who believe that Pacific salmon will not normally feed when spawning and so they change to a lower specialization position to increase their expectancy. Expectancy is relative to the fishery situation and is highly variable, salmon and steelhead are relatively difficult fish to catch, so angler expectancy has to be relative to the species, tackle, and setting.

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A REASSESSMENT OF THE ANGLER

SPECIALIZATION CONCEPT

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The angler specialization concept was reviewed and compared to other theoretical frameworks that are more based in multi-determinate behavioral approaches and cognitive processes. Personal investment theory and expectancy theory are suggested as more theoretically appropriate to measure angler specialization.

Introduction

Angler typologies have been proposed and evaluated since Plato noted in the *Sophist* that it is necessary to "come to an understanding not only about the name of the angler's art, but about the definition of the thing itself" (Hamilton and Cairns, 1961) to determine the angler's impact on the resource and upon society. The importance of those typologies to fishery and recreation management is partially based upon the resource considerations as well as the economic value that we place upon the angler's activities and travel related expenditures.

For example, the reported positive economic impacts of sportfishing on New York's Great Lakes coastal communities emphasizes the need to maintain angler participation and satisfaction since it is important for fishery managers and coastal communities. More than 295,000 anglers fished 2.6 million angler days on New York's Lake Ontario waters in 1988 and they spent \$87.5 million in trip expenditures within the coastal areas (Connelly et al., 1990a). This participation was a dramatic increase in the number of anglers (490%) and angler effort (285%) for Lake Ontario from 1973 to 1988 (Connelly et al., 1990b). Angling participation in New York's Great Lakes waters is estimated to increase to the year 2000 (Dawson and Brown, 1990).

Sportfishery management in the Great Lakes will require an understanding of angler motivations and developmental maturation over time to anticipate angler behavioral reaction to various fishery management alternatives. Information on the motives and expectations of anglers can help fishery managers to determine which management alternatives will meet, redirect, or change angler expectations and motives (Dawson and Wilkins, 1980; Brown, 1987; Gale, 1987).

Angler Motivation and Specialization Theory

The concept of angling specialization to explain the formation of motives and the process of motivational change that leads an

angler to seek different species, settings, equipment, and experiences was proposed by Bryan (1976, 1977, and 1979). Bryan (1979) concluded that there were four basic types of freshwater anglers: (1) the occasional angler with novice ability and only casual interest in the sport; (2) the generalist angler who is interested in catching some fish in any environment by any legal method; (3) the tackle-species specialist who specializes in the skill of a particular angling method and/or angling for a particular species; and (4) the method-species-setting specialist who specializes in the method, species, and setting which make up a particular experience. These angler types are based on their degree of specialization in fishing and their specific motives in using the fishery resource. Anglers reportedly changed attitudes and motivations as specialization increased so that the emphasis shifted from consumption to conservation and natural settings. More specialized anglers were predicted to decrease interest in harvest motives and increase interest in non-harvest motives and specialized fishing equipment.

Several angler studies (Fedler and Ditton, 1986; Absher and Collins, 1987; Siemer et al., 1989; Steele et al., 1990) have reported general support for Bryan's (1979) concept that as anglers become more specialized "the fish are not so much the object as the experience of fishing is an end in itself." For example, boating anglers on Lakes Ontario and Michigan reportedly undergo a maturation or motivational change process over time toward more interest in fishing methods and technique, more interest in the management and conservation of fisheries, and stable or declining interest in the number of fish caught or harvested (Absher and Collins, 1987; Siemer et al., 1989).

Research on the Salmon River (Dawson and Brown, 1989; Connelly et al., 1990c) suggests that the normative concept of recreational specialization and sequential stages of development may not hold true for some segments of anglers. Connelly et al. (1990c) reported that 45 percent of steelhead anglers (highly specialized) also participated in salmon snagging/lifting activities (low specialization and focused on harvest more than skill) in 1989. Neither the researchers nor the fishery managers anticipated the magnitude of the overlap in the salmon snagging, salmon non-snagging, and steelhead angler segments due, in part, to the implicit acceptance of the recreational specialization concept.

The general acceptance of the recreational specialization concept in recreation and fishery management literature (Decker et al., 1987) appears to be its intuitive appeal to both researchers and managers. However, the concept has not been rigorously researched and evaluated via statistical tests in empirical studies on recreational or angler involvement and decision-making. Rather, the concept has been generally accepted and incidental evidence of its appropriateness offered ad hoc. Some re-evaluation of the specialization concept appears necessary to foster additional research. For example, Ditton et al. (1992) note that Bryan has essentially developed a tautology or circular path of logic whereby the specialization hierarchy is defined and measured by the same variables.

Theoretical Comparisons

Bryan's (1979) specialization concept is based on human needs (such as Maslow's hierarchy of needs) and reinforcement or social learning theory. The sequence of events begins with a motivation or stimulus which results in individual behavior and is followed by an intrinsic and extrinsic reward, and then at some interval a repeat of the same action or a similar action. The concept map (Figure 1) outlines the basic sequence of

events and illustrates the feedback or reinforcement loop that provides the behavioral modification necessary for continued involvement. Intrinsic rewards are related to the individuals own internal evaluation of his/her performance (e.g., satisfaction at catching a valued fish species in a

challenging situation and using specialized equipment). Extrinsic rewards are provided by the social group sharing the experience or observing the results of the performance (e.g., praise and social status within the peer fishing group based on an outstanding performance).

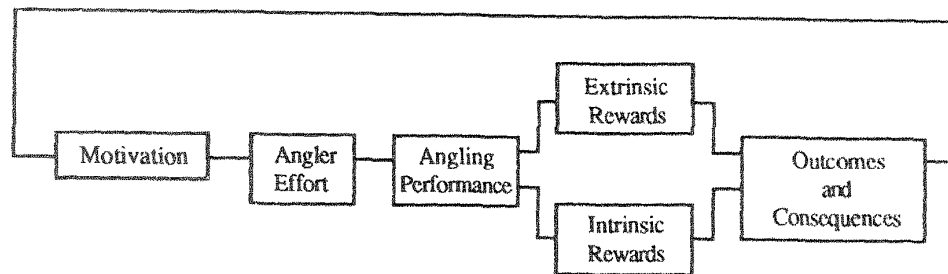


Figure 1. Reinforcement theory model of angler behavior and specialization (adapted from Bryan, 1979; Hamner et al., 1983).

The Recreation specialization concept is based on the human need theory and the reinforcement theory that behavior is closely associated with the positive and negative outcomes learned from past behavior. For example, Bryan (1979) acknowledges that the specialization concept is based on human needs theory such as Maslow's hierarchy of needs, although expressed in recreational specialization stages. The recreation specialization concept has some similar research dilemmas as reported for Maslow's hierarchy of need theory. Wahba and Bridwell (1983) note that the Maslow theory has received little clear or consistent support from available research findings due to the generalized nature of the theory (i.e., it is difficult to operationalize and interpret) and the rigidity of the theory that predicts a fixed hierarchy (i.e., how can a fixed hierarchy model predict behavior that the literature has described as multi-determinate?). Similarly, research questions have been raised about the validity of reinforcement models that consider behavior as determined by the consequences of past behavior and do not consider the cognitive domain in which an individual makes decisions about future behavior based on conscious and subconscious evaluations of actions and consequences (Hamner et al., 1983). More recent motivational research has focused on process models such as personal investment theory and expectancy theory.

A second motivational model that has been proposed by Absher and Collins (1987) for use with the recreational specialization concept is personal investment theory. The difficulties inherent in operationalizing the specialization concept were considered and partially resolved by Absher and Collins (1987) using Machr and Braskamp's (1986) motivation domains in personal investment theory. The five domains or characteristics of motivation are listed by Absher and Collins (1987) as: (1) choice - selection from a set of potential actions or behaviors; (2) persistence - the tendency to choose and return to the same activity or set of activities over a given period of time; (3) continuing motivation - the tendency to return to the same activity or set of activities following some interruption in time; (4) performance - a skill level or perceived ability to perform a task or activity; and (5) intensity - the commitment level to an activity and its relative importance compared to other activities in life.

The personal investment theory and motivational domains were utilized by Absher and Collins (1987) to develop a three level specialization typology for analysis of anglers fishing on southern Lake Michigan. A specialization index score was

computed for each angler through five motivational domain subindices. Absher and Collins concluded that the resulting specialization index provided an angler typology that permitted discriminant analysis to be used to detect differences among the groups regarding management preferences and that the analysis was useful in evaluating potential management actions and regulations.

Siemer et al. (1989) conducted an analysis of the motivations of Lake Ontario boat anglers fishing for salmonids by using personal investment theory. The study reported using participation as a measure of investment and two motivation scales (i.e., motivation to participate in recreation, motivation to participate in salmon fishing) to compare the differences between two levels of personal investment. Siemer et al. (1989) reported "some evidence to support the notion that anglers undergo a process of motivation change or maturation over time involving increased importance on fishing methods and conservation/management of fisheries resources, and a stable or decreased interest in number of fish caught or kept."

A third motivational model that appears appropriate to apply in recreational settings is expectancy theory which includes cognitive processes as central to the behavior decision-making/involvement process experienced by recreationists and anglers. Cognitive theory approaches the motivation phenomenon from the perspective of expectancy whereby behavior is influenced by past outcomes but is more selective in anticipation and ascribing response-outcome probabilities than is reinforcement theory. Expectancy theory proposes that three variables are necessary to predict motivation: (1) Expectancy - the probability (ranges from 0 to 1) that an individual ascribes to his/her ability to perform a task successfully; (2) Instrumentality - the probability (ranges from -1 to +1) of attaining the desired outcome; and (3) Valence - the perceived desirability or value (ranges from -1 to +1) the individual places on the expected outcome or reward (Vroom, 1964; Nadler and Lawler, 1983). Motivation is multiplicative for these three variables so that each variable must have a relatively high positive value to provide the motivation for effort and activity. If, at any time, one or more of the variables approaches zero or turns negative, then the motivation to act will diminish correspondingly. A conceptual map of the expectancy theory model in Figure 2 illustrates the relationship of fishing motivation to performance and satisfaction.

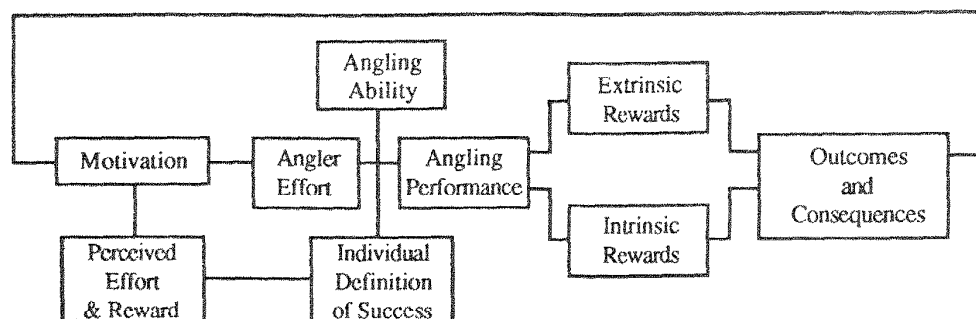


Figure 2. Expectancy theory model of angler behavior (adapted from Hamner et al., 1983; Landy & Trumbo, 1983; Nadler & Lawler, 1983).

Stating the expectancy model in recreational salmon fishing terms, if an angler believes he/she is able to successfully catch a salmon by a particular angling method and in a specific river setting, then a high expectancy value will be assigned. The angler who believes that catching a salmon (performance) leads to desired extrinsic (e.g., social recognition of achievement by peers) and intrinsic (e.g., sense of self-achievement) rewards will assign a high value to instrumentality. If the rewards are perceived by the angler to be of personal importance, then a high value will be assigned to valence. The multiplicative result of these three variables via the cognitive process outlined in expectancy theory is motivation.

Conclusions

The literature indicates little direct support for the fishing specialization concept. The parallel with Maslow's theory is important to understand because both have similar research implementation difficulties, as noted by Wahba and Bridwell (1983): "Maslow's Need Hierarchy Theory presents the student of work motivation with an interesting paradox: the theory is widely accepted, but there is little research evidence to support it." The theoretical improvements suggested herein are to assess the utility of adding cognitive dimensions to the fishing specialization concept to reflect the cognitive and multi-determinate behavior of anglers and to develop a more testable theory that addresses the conditions under which the concept is valid and reliable. For example, how does angler expectancy for success relate to specialization? Are the relationships in behavioral outcomes (i.e., satisfaction) and motivations causal or correlational?

The two theories reviewed herein, personal investment theory and expectancy theory, appear to have some promise for adding cognitive dimensions and antecedent conditions. The former has been explored by two research projects and many unanswered questions remain as to its applicability and utility. The latter theory has not been tested in recreational or fishing recreation research and appears to hold some promise to integrate motivational research with a more comprehensive theoretical base so that the implications will be more apparent for fishery and recreation managers. Recent work by Ditton et al. (1992) suggests that additional approaches also merit investigation as more information is published on alternate or revised approaches to defining specialization.

Sportfishery management on the Great Lakes will require a more comprehensive model of angler specialization over time to anticipate angler behavioral reaction to sportfishery

management alternatives. This information can help fishery managers and educators to evaluate management alternatives that help to meet, redirect, or change angler motives and expectations. Anticipating angler development and redirecting and encouraging anglers toward higher degrees of specialization (i.e., shift from harvesting fish to a greater emphasis on resource conservation and appreciation) may, ultimately, lead to more effective indirect angler management and partially relieve the enforcement burden of direct angler regulations. Given the current economic impacts of sportfishing on the Great Lakes, the need to maintain angler participation and satisfactions is economically important for coastal communities and sportfishery dependent businesses.

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RECREATION SPECIALIZATION AND THE ANALYSIS OF ANGLER DIFFERENCES

ACCORDING TO AGE COHORT

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We segmented a sample of sport fishermen into six unique age cohorts for the purposes of determining if significant differences existed on four recreation related dimensions. No significant differences for activity or non activity-specific elements of the experience were found. Some differences were found for mediated interaction and resource dependency, and clear differences were found for support of various management rules and regulations. Predictions and results were framed in terms of recreation specialization.

Introduction

Determining the current and future levels of demand for any given recreational activity or experience has been an important and ongoing task for managers and researchers. Most early efforts at forecasting future participation levels used simple straight-line extrapolations (Loomis and Ditton, 1988; West 1983). However, such work was limited in that it lacked a detailed demographic component (Murdock et al., in press). As such, they could not take into account the effects of demographic forces (such as age, race or gender).

In response to this limitation, cohort-based projection models have been developed (Loomis and Ditton 1988; Murdock et al. 1990). The use of these cohort component models allows demographic characteristics to be accounted for in calculations of demand projections. The demographic characteristic receiving the most attention has been age. Projections of future demand have taken into account how the population age structure will shift over time, and consequently how the demand structure will shift over time as well. Results show that demand is not evenly distributed across age cohorts, and that the distribution of demand by cohort will shift over time as the population age structure shifts (Loomis and Ditton 1988; Murdock et al. 1990).

These studies have provided greater insight into the level of demand for certain activities, its distribution by age and how it will shift over time. However, these studies are still limited in that they provide only an understanding of days of demand by a given age cohort. It forces one to assume that a day of participation by a sixty-year old is the same as a day of participation by a twenty-year old. As such, demand projections using a cohort-component model have limitations in their usefulness as currently applied. The effort to understand other key factors relating to demand for recreation

opportunities, such as user characteristics, motivations, expectations, and preferences, for example, has not yet been made.

The first purpose of this paper is to extend our current understanding of demand as based on cohort component models by testing for differences between five distinct age cohorts on a variety of recreation-related dimensions. Specifically, we will examine activity and non activity-specific motivations, level of resource dependency, level of mediated interaction and support for rules, regulations and management policies. We will not be determining demand, but instead determining differences between cohorts on these dimensions, which could subsequently be attached to demand projections and thus provide a better picture of the actual demand for experiences.

Our conceptual framework is recreational specialization, as reconceptualized by Ditton et al. (1992). This will provide us an opportunity to test several propositions of this recent version of specialization, which is the second purpose of this paper.

Conceptual Framework

Our conceptual framework is based on recreation specialization, as reconceptualized by Ditton et al. (1992). Building upon the social world/social subworld literature, Ditton et al. define specialization as:

- 1) A process by which recreation social worlds and subworlds segment and intersect into new recreation subworlds, and
- 2) the subsequent ordered arrangement of these subworlds and their members along a continuum.

"At one end of the continuum is the least specialized subworld and its members, and at the other end of the continuum is the most specialized subworld and its members. Between these two extremes are any number of subworlds having intermediate levels of specialization" (Ditton et al., 1992).

From this definition and the related literature, Ditton et al. (1992) state eight propositions. We will test propositions four, six, seven and eight (see Ditton et al., 1992, for further details).

Ditton et al. (1992) subjected propositions six, seven and eight to empirical testing, and found strong support for all three. Results showed that high specialization anglers have a higher level of resource dependency, a higher level of mediated interaction, and attached less importance to activity-specific elements and more to non activity-specific elements of the fishing experience than do low specialization anglers.

In their study, Ditton et al. (1992) segmented their sample (or social world) of sport anglers into four ordinal subworlds based on total days fished during the previous twelve months. Anglers who fished the most were defined as the most specialized, and those who fished the least were the least specialized. Ditton et al. (1992) suggest that "participant's age" or "number of years of participation" should also be considered as a means of classification, with the older or more experienced anglers being more specialized.

We too will use a single dimension for categorizing and ordering our specialization subworlds. Based upon our purpose for this paper, and the work of Ditton et al. (1992), we will use age as our classification variable. More specifically, we will segment our study sample into five unique age cohorts. The ages contained within each of the five cohorts are consistent

with the age cohorts used in previous work (Loomis and Ditton, 1988). The youngest age cohort will anchor the least specialized end of the specialization continuum, and the oldest age cohort will anchor the most specialized end.

Hypotheses

- Ha1:** Anglers in older age cohorts attach greater importance to activity-specific elements of the fishing experience than do anglers in younger age cohorts.
- Ha2:** Anglers in younger age cohorts attach greater importance to non activity-specific elements of the fishing experience than do anglers in older age cohorts.
- Ha3:** Anglers in older age cohorts will have a higher level of mediated interaction than will anglers in younger age cohorts.
- Ha4:** Anglers in older age cohorts will have a higher resource dependency than will anglers in younger age cohorts.
- Ha5:** Anglers in older age cohorts will agree more strongly with rules and regulations than will anglers in younger age cohorts.

Methods

Data collection was accomplished through a mail survey of licensed Iowa sport fishermen. Using license receipts as a sampling frame, a systematic random sample of 600 licensed anglers was manually selected from state files. The survey was administered during the spring of 1989, following procedures outlined by Dillman (1978). A final return of 434 usable questionnaires was achieved (a response rate of 78.8% when non-deliverable and non-usable questionnaires were excluded).

Classification Procedure

We segmented our sample into five distinct age cohorts (Table 1). These five age cohorts, when arranged from youngest to oldest, form our specialization continuum with the youngest being the least specialized and the oldest being the most specialized. This classification served as the independent variable for analysis purposes.

Table 1. Age cohort categories.

Age Cohort	n	%
15 - 24	50	11.8
25 - 34	115	27.1
35 - 44	111	26.2
45 - 54	72	17.0
55 +	76	17.9
Total	424	100.0

Dependent Variable Measurement

Activity and non activity-specific elements. A total of seventeen items were used to measure the activity and non activity-specific elements of the sport fishing experience. The activity-specific elements of the experience are specific to the sport of fishing, and cannot be pursued or obtained in other activities. Six of the eight items are attitude statements developed by Graefe (1980), with the other two being motive statements (Ditton et al., 1992). All eight items were measured on a five-point Likert-type scale.

The generic, or non activity-specific elements of the fishing experience were measure with nine motive statements. These

motives are common to many outdoor recreation activities, and are not specific to the sport of fishing. Each motive statement is a single-item measure from the following Driver (1977) domains: Family Togetherness, Being with People, Learning-Discovery, Relationships with Nature, Physical Rest and Escape Personal-Social Pressure. As with the non activity-specific elements, these nine motive statements were measured on a five point Likert-type scale.

Mediated interaction. Survey recipients were asked to indicate the extent to which they made use of seven varied sources of information. These sources ranged from Iowa state agencies, to printed information, to electronic media to word-of-mouth. Angler responses were measured on a five-point Likert-type scale.

Resource dependency. Respondents were asked to indicate, on a five-point Likert-type scale, the extent to which they agreed or disagreed with seven attitude statements (Graefe 1980) concerning the catching of fish. These items focus on the size, number and species of fish to be caught. The more they agreed with a statement, the greater their resource dependency.

Support for rules and regulations. Our final hypothesis examines differences between anglers in different age cohorts on the extent to which they support or oppose various rules and regulations concerning sport fishing. Respondents were asked to indicate on a five-point Likert-type scale the extent to which they supported or opposed ten existing or possible management rules and regulations, and three management policies.

Data Analysis

The procedure used to test the null hypothesis of equality of group means for age cohort categories was a one-way analysis of variance (ANOVA). A null hypothesis was rejected at the $p=0.05$ level of significance. To identify where specific between-cohort differences existed, a Student-Newman-Keuls post-hoc test was performed, which is considered an appropriate all-around test for this purpose (Kirk, 1982).

Results

Hypothesis One

Results of the ANOVA show significant differences between age cohorts on only one of the eight measures of activity-specific elements of the fishing experience (Table 2). We therefore fail to reject H_{01} .

Hypothesis Two

Results of the ANOVA revealed significant differences between age cohorts on only two of the nine items used to measure the non activity-specific elements of the fishing experience (Table 3). We therefore fail to reject H_{02} .

Hypothesis Three

Results of the ANOVA revealed significant differences on three of the seven items (Table 4). These results provide some support for our null hypothesis, and we therefore tentatively reject H_{03} . Our results relative to the alternative hypothesis were not, however, as predicted. We had argued that anglers in the older age cohorts would have a higher level of mediated interaction than would anglers in the younger age cohorts. Results show, in general, that the opposite occurred. For each of the items having significant results, anglers in the youngest age cohort had the highest level of mediated interaction. As a result, we cannot accept H_{a3} as stated.

Table 2. Results of test for differences in mean scores for activity-specific elements of the fishing experience scale items between age cohorts.

Items	Group Mean Score					F	p
	Student-Newman-Keuls test						
I'm happy if I don't keep the fish	4 <u>2.97</u>	5 <u>3.13</u>	3 3.37	2 3.44	1 3.52	3.065	0.017
For the experience of the catch	5 <u>3.29</u>	3 <u>3.32</u>	4 3.37	2 <u>3.40</u>	1 <u>3.86</u>	2.192	0.069
I'm happy if I release the fish I catch	4 <u>3.07</u>	5 <u>3.30</u>	1 3.34	3 <u>3.42</u>	2 <u>3.50</u>	1.950	0.101
I'm happy if I don't catch a fish	4 <u>2.68</u>	5 <u>2.74</u>	3 2.86	1 2.88	2 <u>2.88</u>	0.724	0.576
Fishing is successful if no fish are caught	5 <u>3.62</u>	2 <u>3.64</u>	4 3.71	1 <u>3.74</u>	3 <u>3.78</u>	0.484	0.747
Fish for eating	3 <u>2.46</u>	4 <u>2.49</u>	5 <u>2.52</u>	2 <u>2.62</u>	1 <u>2.67</u>	0.428	0.788
For sport and pleasure	1 <u>3.10</u>	4 <u>3.11</u>	3 <u>3.21</u>	2 <u>3.27</u>	5 <u>3.27</u>	0.391	0.815
I give away the catch	4 <u>2.25</u>	3 <u>2.31</u>	2 <u>2.32</u>	1 <u>2.36</u>	5 <u>2.37</u>	0.210	0.933

Table 3. Results of test for differences in mean scores for importance to non activity-specific elements of the fishing experiences Scale items between age cohorts.

Items	Group Mean Score					F	p
	Student-Newman-Keuls test						
To be with friends	3 <u>2.89</u>	4 <u>3.09</u>	2 <u>3.11</u>	5 <u>3.13</u>	1 <u>3.84</u>	5.807	0.000
To be close to the sea	2 <u>2.75</u>	3 <u>3.03</u>	1 <u>3.16</u>	4 <u>3.35</u>	5 <u>3.41</u>	4.531	0.001
For family recreation	1 <u>3.35</u>	5 <u>3.35</u>	2 <u>3.49</u>	3 <u>3.69</u>	4 <u>3.73</u>	2.058	0.086
To experience new and different things	3 <u>2.77</u>	4 <u>2.86</u>	5 <u>2.91</u>	2 <u>3.11</u>	1 <u>3.14</u>	1.807	0.127
For relaxation	2 <u>3.99</u>	1 <u>4.04</u>	3 <u>4.13</u>	5 <u>4.21</u>	4 <u>4.31</u>	1.411	0.230
To be outdoors	3 <u>3.96</u>	4 <u>3.97</u>	5 <u>3.99</u>	2 <u>4.07</u>	1 <u>4.26</u>	1.275	0.279
To experience natural surroundings	3 <u>3.46</u>	2 <u>3.61</u>	4 <u>3.61</u>	5 <u>3.71</u>	1 <u>3.84</u>	.159	0.328
To get away from other people	5 <u>3.63</u>	2 <u>3.71</u>	3 <u>3.82</u>	1 <u>3.92</u>	4 <u>3.94</u>	0.906	0.460
To get away from the regular routine	4 <u>3.86</u>	2 <u>3.96</u>	3 <u>3.97</u>	1 <u>4.06</u>	5 <u>4.06</u>	0.484	0.748

Table 4. Results of test for differences in mean scores for mediated interaction scale items between age cohorts.

Items	Group Mean Score					F	p
	Student-Newman-Keuls test						
TV Shows	4 <u>2.49</u>	5 <u>2.55</u>	3 <u>2.72</u>	2 3.00	1 3.22	5.096	0.001
Bait Shops	5 <u>2.86</u>	4 <u>3.00</u>	3 <u>3.21</u>	2 3.30	1 3.36	3.133	0.015
Magazine Articles	4 <u>2.63</u>	3 <u>2.64</u>	5 <u>2.66</u>	2 <u>2.90</u>	1 3.14	2.814	0.025
Newspaper Articles	5 <u>2.44</u>	3 <u>2.59</u>	4 <u>2.66</u>	2 <u>2.76</u>	1 <u>2.78</u>	1.532	0.192
Fish Clubs	3 <u>1.76</u>	5 <u>1.78</u>	2 <u>1.92</u>	4 <u>1.92</u>	1 <u>2.08</u>	1.209	0.306
Iowa Department of Natural Resources	4 <u>2.74</u>	5 <u>2.79</u>	3 <u>2.91</u>	1 <u>2.98</u>	2 <u>3.03</u>	1.029	0.392
Radio Shows	3 <u>1.95</u>	4 <u>2.06</u>	5 <u>2.08</u>	2 <u>2.10</u>	1 <u>2.22</u>	0.647	0.629

Table 5. Results of test for differences in mean scores for resource dependency scale items between age cohorts.

Items	Group Mean Score					F	p
	Student-Newman-Keuls test						
To obtain a "trophy" fish	3 <u>2.65</u>	4 <u>2.75</u>	2 <u>2.99</u>	5 <u>2.99</u>	1 3.26	7.393	0.000
The bigger the fish the better the trip	3 <u>2.85</u>	4 <u>2.93</u>	2 <u>3.11</u>	5 <u>3.13</u>	1 <u>3.51</u>	4.022	0.003
The more fish I catch, the happier I am	4 <u>3.31</u>	5 <u>3.32</u>	3 <u>3.33</u>	2 <u>3.60</u>	1 3.76	2.587	0.036
A successful trip is catching many fish	3 <u>2.77</u>	2 <u>2.96</u>	4 <u>3.01</u>	1 <u>3.14</u>	5 <u>3.16</u>	2.025	0.090
I prefer one or two big fish to ten small fish	4 <u>2.91</u>	3 <u>3.06</u>	2 <u>3.11</u>	5 <u>3.20</u>	1 <u>3.34</u>	1.293	0.272
I like to fish where there are several kinds of fish to catch	3 <u>3.82</u>	4 <u>3.93</u>	5 <u>3.93</u>	1 <u>3.94</u>	2 <u>3.97</u>	0.523	0.719
The type of fish I catch doesn't matter	3 <u>3.19</u>	4 <u>3.20</u>	2 <u>3.27</u>	5 <u>3.30</u>	1 <u>3.38</u>	0.389	0.817

Hypothesis Four

Results of the ANOVA show significant differences between the age cohorts on measures of resource dependency for three of the seven items (Table 5). As in hypothesis three, these results are not conclusive. They do, however, provide tentative support for our argument that the age cohorts would differ in their

resource dependency. We therefore reject Ho4 as stated. The results for the three significant items, however, were again not in agreement with our alternative hypothesis. The younger cohorts were not the least resource dependent, as predicted. They instead were the most resource dependent. As a result, we cannot accept Ha4 as stated.

Table 6. Results of tests for differences in mean scores for agreement with Various rules and regulations.

Items	Group Mean Score					F	p
	Student-Newman-Keuls test						
No fishing in certain restricted areas	1 2.92	2 3.34	4 3.51	3 3.62	5 3.76	5.500	0.000
Prohibiting certain sport fishing gear	1 2.96	2 3.31	4 3.36	3 3.51	5 3.72	4.939	0.001
Banning species during times of the year	1 3.10	2 3.28	4 3.50	3 3.56	5 3.76	4.412	0.002
Prohibiting certain types of bait	1 2.84	2 3.09	4 3.10	3 3.28	5 3.49	3.688	0.006
Maximum size limit	1 2.70	4 2.97	2 3.15	3 3.15	5 3.42	3.387	0.010
Stocking fish not native to Iowa	4 3.50	3 3.56	5 3.62	2 3.81	1 4.00	3.131	0.015
Banning certain species in certain areas	1 3.14	2 3.30	4 3.39	5 3.60	3 3.61	2.945	0.020
A closed season	3.20	3.25	3.51	3.51	3.68	2.591	0.036
A voluntary catch and release program	5 3.46	3 3.47	4 3.57	2 3.71	1 3.86	1.989	0.095
A slot limit	4 2.72	3 2.94	5 2.99	1 3.06	2 3.06	1.394	0.235
A daily bag limit	3.91	3.95	3.95	3.98	4.20	1.002	0.406
A minimum size limit	4.01	4.04	4.14	4.21	4.24	0.816	0.515
Stocking native fish	4 4.21	1 4.22	3 4.22	5 4.25	2 4.27	0.033	0.998

Hypothesis Five

Our fifth hypothesis predicted that anglers in the younger age cohorts would be less supportive of rules, regulations and management policy than would anglers in the older age cohorts. Results of the ANOVA provide substantial support for this prediction (Table 6). Eight of the thirteen items were significantly different between the age cohorts. In addition, for seven of the eight significant items, the ordering of the means were as predicted. Anglers in the older age cohorts were more supportive of various rules, regulations and management policies than were anglers in the younger age cohorts. We therefore reject H_{05} , and accept H_{a5} as stated.

Discussion and Conclusions

Results of this study indicate that for some dimensions, differences exist between anglers in different age cohorts. For other dimensions, few differences were found. No significant between cohort differences were found on measures of the activity-specific and non activity-specific elements of the fishing experience. There were some significant findings relative to mediated interaction and resource dependency, but the results were not strong or pervasive. The strongest and clearest findings were that anglers in older cohorts were much more supportive of various management rules and regulations. Information of this type can be useful to resource managers as they seek to provide the type of experience sought, and as they seek support for management policies.

These results provided some support for recreation specialization as presented by Ditton et al. (1992). Where results were not significant, and null hypotheses not rejected, questions can be raised. For hypotheses one and two, is the re-conceptualization flawed, or is age cohort an inadequate or inappropriate classification variable? Results from Ditton et al. (1992) suggests that age cohort may not be an adequate classification tool. Continued research is necessary to further develop and understand recreation specialization.

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